

THE HIVE
AND
THE HONEY-BEE:

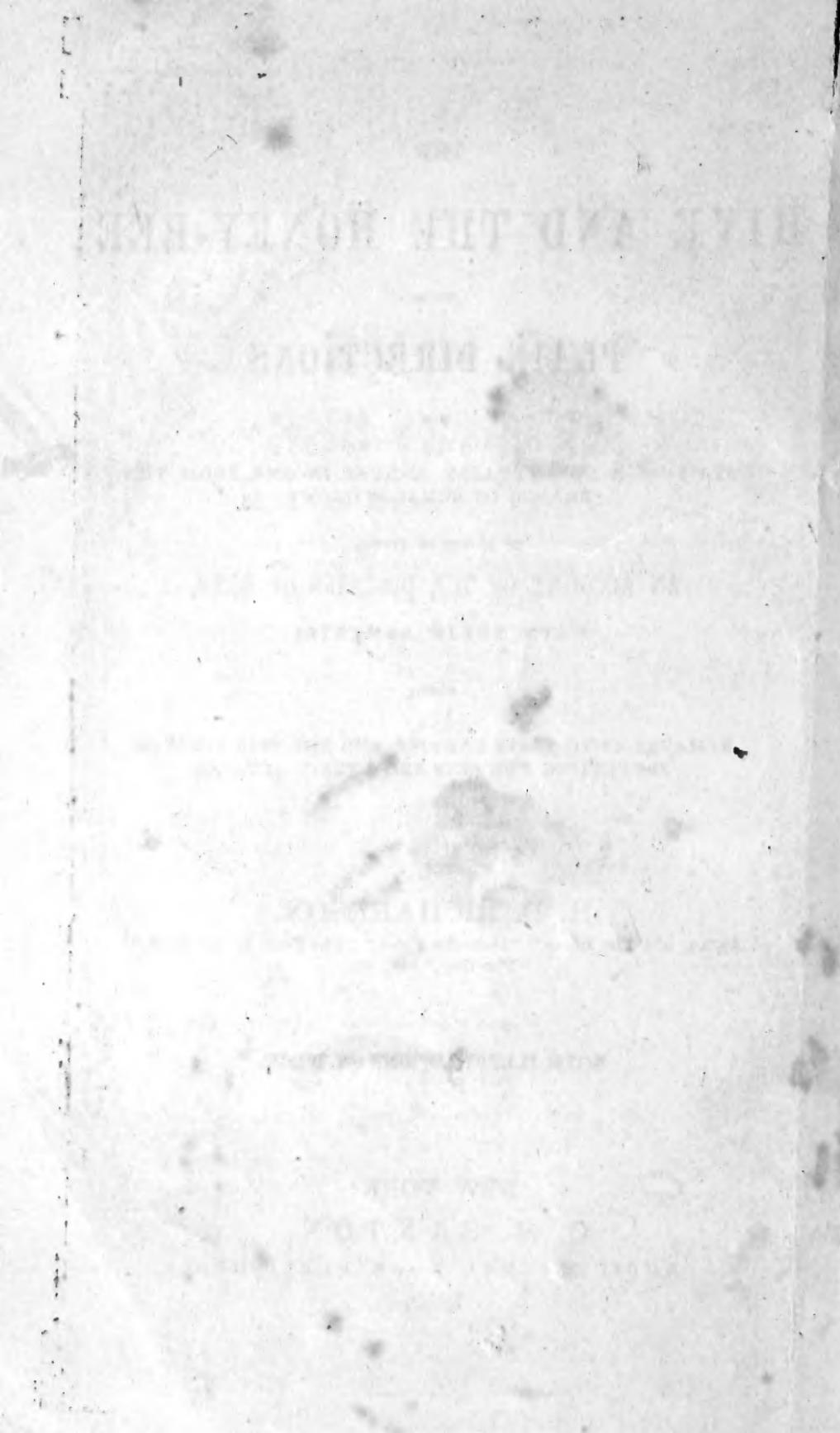
WITH AN ACCOUNT OF THE
DISEASES OF BEES, AND THEIR REMEDIES.

BY H. D. RICHARDSON,
AUTHOR OF "THE HORSE" "THE HOG," &c., &c.



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THE

HIVE AND THE HONEY-BEE; WITH PLAIN DIRECTIONS

FOR

OBTAINING A CONSIDERABLE ANNUAL INCOME FROM THIS
BRANCH OF RURAL ECONOMY.

TO WHICH IS ADDED,

AN ACCOUNT OF THE DISEASES OF BEES,
WITH THEIR REMEDIES.

ALSO,

REMARKS AS TO THEIR ENEMIES, AND THE BEST MODE OF
PROTECTING THE BEES FROM THEIR ATTACKS.

BY

H. D. RICHARDSON,

Author of "The Horse," "Domestic Fowl," "The Pests of the Farm,"
"The Hog," etc., etc.

WITH ILLUSTRATIONS ON WOOD.

NEW YORK:

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THE HIVE AND THE HONEY-BEE.

CHAPTER I.

INTRODUCTORY.

THE subject of Bee culture is one that should occupy a far more prominent position than it at present does, in the domestic economy of the farmer. When successfully conducted, the management of these interesting insects becomes a source of pecuniary profit ; and to be a successful cultivator requires only a very moderate degree of care and attention : let it be remembered that the first outlay in procuring a swarm, and providing suitable accommodation in the shape of hives or bee-boxes, is the only expense to be incurred ; while the return, yielded by each honey harvest, is very considerable, and to be regarded as clear gain.

In order to give the reader some idea of the profit which may accrue from bee-keeping, under favorable circumstances, I may mention a statement of the late Mr. Nutt, relative to the quantity of honey taken by him from one set of collateral boxes, in a single season, viz : 183 lbs. 5 oz.

This statement has surprised many, and its accuracy has been doubted by some bee-keepers ; and it certainly does, at first sight, appear startling. A correspondent informed me that he had last season, and one considered a bad one for bees, taken 102 lbs. of honey from two sets of boxes, and that he might have taken, perhaps, 10 lbs. more, without impoverishing the bees. The writer on Bees in the "Naturalists' Library," details the quantity taken from cottage hives in one season at about 10 lbs. from each hive. This is a very low average, however, and it has reference to a single deprivation only, as well as to a very imperfect description of hive. It is not my intention to exhibit the advantages of keeping bees on old and erroneous, and, I

wish I could add, *exploded* systems of management, but to show what can be done, if done *correctly*. I shall say nothing, therefore, as to what may be done with the common old hives, as I regard keeping bees in them, when more fitting ones may so easily be procured, as evincing something very like a self-willed determination *not* to make profit. Bee-keeping, when conducted on a proper principle, will form no mean item in the domestic economy of the extensive agriculturist; while to the humble cottier it will prove a little fortune, and furnish the means of effectually and permanently bettering his condition. I would say that a single set of collateral boxes, so simple in its construction, and composed of such inexpensive materials that any one could make them, ought to yield a profit at least sufficient to pay the rent of from five to ten acres of land, by no means a despicable holding, and one which, in its turn, will become a source of comfort, of independence, of social, and consequently, of course, of *national* amelioration.

The importance of honey both as an article of food and a valuable medicament, would appear to have been known to the ancients from the very earliest times. "The land of promise," to reach which the Israelites journeyed in protracted pilgrimage across an arid desert for a period of forty years, was described as "a land flowing with milk and *honey*;" while numerous passages throughout the sacred volume furnish evidence of the attention devoted by the ancient fathers of the Jewish people to the habits of the Bee itself, and the degree of acquaintance with that insect at which they had arrived. We are also told that several of the enlightened sages of ancient Greece deemed this subject worthy years of diligent investigation. Pliny informs us that Aristomachus made bees his whole study for a period of fifty-eight years.

Philiscus retired into desert places for the purpose of keeping and contemplating them.

Aristotle, also, wrote much concerning bees, proving himself intimately acquainted with the subject, and his observations were subsequently confirmed and enlarged upon by Pliny. Aristotle's observations furnished the Mantuan bard, Virgil, with the groundwork of his very beautiful, and in many respects faithful descriptions of these insects, and their management. We have since them Columella and others, and in more modern times an actual host of writers, amongst whom I may mention Prince Frederick

Ceci, Swammerdam, Boerhave, Wildman, Reaumur, Huber, Huish, Nutt, Cotton, Briggs, with a host of other and eminent names, to many of whom, but to Mr. Briggs in particular, I have to acknowledge myself indebted, for some of the suggestions conveyed in the course of these pages, which it is to be hoped may prove as useful as it is my earnest desire they should, and I sincerely trust that no obstinate attachment to old usages, or dislike to encounter the very trifling degree of trouble consequent on a change of management, will prevent their being, at all events, taken into consideration.

CHAPTER II.

THE HONEY-BEE AND ITS THREE CLASSES.

THE Honey-bee belongs to the social family of the Apidæ (from *Apis*, the Latin for bee), to the order, fifth of INSECTA, termed Hymenoptera, and including all insects possessing four membranaceous, gauze-like wings, of unequal sizes, furnished also with a sting, or process at the extremity of the tail, resembling one. The interesting family of bees now under consideration, is known peculiarly as the *Apis Mellifica*, Honey-making or Honey-bee—not that this species alone makes honey, but that it is the one so long known to man, and which has so long yielded to him its rich store of sweets.

Of the family of the Honey-bee there are two varieties to be met with in Europe—one inhabiting the north, and the other the south ; the principal difference, however, would appear to consist in color, the southern bee having the rings encircling his body of a deeper red color ; the description, consequently, of the common Hive-bee of the British Islands will apply, sufficiently for every practical purpose, to both insects.

The number of bees contained in a hive will, of course, vary with their condition, and the amount of accommodation they possess : whatever, however, be their numbers, their occupations are alike, and are similarly distributed amongst the three classes composing the inmates of the hive. These classes are, first, the Queen-bee, the sovereign of the community, and literally, the prolific parent of her subjects. The Queen-bee reigns alone ;

but one of her sex is permitted to exist in a hive at the one time, and to her protection and comfort are the energies of the other bees to be directed. The Queen-bee may be recognized by her greater length of body, which is of a blackish color above, and of a yellowish tint beneath. She is usually, but not by any means invariably, of a larger size than either of the other classes; her abdomen

contains two ovaries, or receptacles for eggs; and her sting is of a curved form. The Queen-bee commences depositing her eggs when about five days old; during the heat of the season she lays from 150 to 200 eggs per day, and lays with little or no intermission from early Spring to the middle of Autumn. The progress of her eggs from their deposition to maturity, shall be treated of elsewhere.

The second class of bees are the Drones. These are bulkier in the body than either the Queen or the Working-bee. Their



head is rounder, proboscis shorter, eyes fuller, an additional articulation to the antennæ, and *no sting*. They also make more noise in flying than the other bees. The Drones are the *males* of the hive; by them the royal mother is impregnated and her eggs fertilized. How or when

this intercourse takes place has long furnished philosophers with a subject for controversy and inquiry; and it has not even yet been set at rest in such a manner as to admit being proved to a positive demonstration.

Aristotle supposed that no such connection took place; Swammerdam held the same opinion, but imagined that she required to be in the neighborhood of the Drones, from whose bodies there proceeded to her a *vivifying aura*, producing fertilization.

It has been by some supposed that the eggs are fertilized by the Drones after having been deposited. This cannot be the case, as many accurately instituted experiments satisfactorily prove that eggs *once laid* will progress to maturity, and prove fertile in the absence of Drones.

M. de Reaumur described passages which occurred between the Drones and the Queen, which were sufficient to induce suspicions at least of somewhat more than he actually witnessed,

but farther, he never could ascertain. The passages to which I allude are not very creditable to the royal character, from whom De Reaumur states all the advances came, while the Drones appeared cold, distant, and to prefer being let alone, destitute of all gallantry, and thoroughly justifying their name.

The celebrated Huber, whose reiterated experiments and close observation entitle him to the greatest confidence, is of opinion that actual intercourse does take place, not, however, while the parties are in the hive, but during their flight in the air. This also satisfactorily explains the reason why the number of drones in each hive is so great, viz., in order that the queen-bee may have the greater likelihood of meeting with a consort when on the wing; it is also probable that the drones perform some yet unexplained functions relative to the young or larvæ. The late Mr. Nutt coincided with Mr. Huber in this opinion, while at the same time he expressed his conviction that this will ever remain a debateable point. Mr. Huber, likewise, was of opinion that the Queen, once impregnated, remained so during her life; and that as she exists for some years, the Drones are called into existence for the purpose of fecundating the young Queens, or supernumeraries—insects kept as it were in *reserve*—lest she which first comes forth should prove sterile, or meet with any casualty. During the working season, especially the months of May, June, and July, when the working bees are continually absent from the hive, the presence of the Drones is perhaps requisite for some offices they may render the larvæ; but whether they are spared for that purpose, or are, contrary to Huber's opinion, still requisite for the impregnation of the Queen, I am not prepared to say; but the fact remains the same, that at the end of summer they are ignominiously expelled the hive, and even slain by the workers, as if they, being of no longer any utility to the community, should not be fed from the store during winter, and were killed to avoid this unnecessary waste. This destruction usually takes place in August or the end of July.

During summer, the Drones remain dispersed through different parts of the hive, but towards its close they assemble together in companies, as if preparing for their impending fate, which they await in patience, or rather, perhaps, in motionless lethargy. When the attack commences, they resist to their utmost; from the number of their executioners, how-

ever, and their own deficiency, not being furnished with a sting, they have not a shadow of chance.

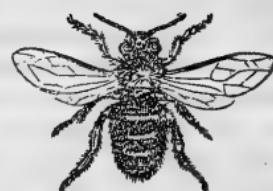
It is, perhaps, unnecessary to observe that the Drones do not work for the support of the hive, but lead an idle life, feeding upon the produce of others' labor.

We now come to the most interesting inmate of the hive—the **WORKING-BEE.**

The Working-bee is considerably less than either the Queen-bee or the Drone. It is about half an inch in length, of a blackish brown color, covered with closely set hairs all over the body, which aid it in carrying the farina it gathers from the flowers ; and on the *tibia*, or *forearm*, as it were, of the hind leg, is a cavity of cup-like form, for the reception of the little kneaded ball of pollen. It is the Working-bee which collects honey and pollen, and which forms the cells, cleans out the hive, protects the Queen, looks after the condition of the young brood, destroys or expels the Drones, when these are no longer necessary to the well-being of the community ; who, in short, performs all offices connected with the hive and its contents, save only those which have reference to the reproduction of the species. The Working-bees are of no sex, and are furnished with a horny and hollow sting, through which poison is ejected into the wound it makes ; this poison is of an acrid character, and of great power in its effects, proving fatal to any insect, and instances being on record of its proving so to horses and cattle, nay, even to human beings : when human beings, however, are stung (an accident that will happen very seldom, if they use the precautions, in manipulating with their bees, that shall be detailed in the course of this volume), they can instantaneously obtain relief by pressing upon the point stung with the tube of a key ; this will extract the sting, and relieve the pain, and the application of common spirits of hartshorn will instantaneously remove it ; the poison being of an acid nature, and being thus at once neutralized by the application of this penetrating and volatile alkali.

I may here describe the structure of the bee. The one description answering, with some exceptions, to be pointed out as I proceed, for the three classes—Queen—Drone—and Workers.

The bee is, like *insects* generally (which derive their name



from two Latin words, signifying *cut in parts*, or divided), composed of three parts—the head, thorax or chest, and abdomen. The shape of the head varies somewhat, as also does its size, in the three classes ; it is attached to the thorax by a thin ligament, and the thorax is attached in a similar manner to the abdomen. In front of the head are two eyes, which are protected by hairs from any substances that might otherwise injure them, and on the top of the head are three smaller eyes. This visual apparatus renders the bee's power of sight a very extended one. Two *feelers*, or antennæ, spring from between the front eyes, and curve outwards on each side ; these are endowed with a very acute sense of touch, and doubtless perform many of the offices of eyes in the dark recesses of the hive. It is probably by the assistance of these delicate and highly sensitive organs that these insects form their combs, fill their cells, and feed the young. I am of opinion also, that they serve as a medium by means of which the bees convey intelligence to each other.

The mouth of the bee is composed of a pair of mandibles, or jaws, which open vertically, and act (opening and shutting) to the right and left. These are furnished with teeth at their extremities. The mouth is also furnished with a very minute tongue, and with a long, slender instrument, called a proboscis, or trunk, resembling in form and use that of the elephant ; it is composed of numerous cartilaginous rings, fringed with minute hairs. This instrument does not, however, act as a tube, but by rolling about and attaching to the hairs which fringe it, whatever substances the insect wishes to convey to the mouth ; from about the base of the proboscis also arise the *labial feelers*, as they are called, which are also furnished with a hairy fringe.

The bee possesses three pair of legs, of which the posterior are the longest, and the anterior the shortest. These are formed and articulated much like the same limbs in man, and are attached to the thorax ; at their extremities we find two little hooks, which appear like sickles, or reaping hooks, and have their points opposed to each other. By means of these, the insect suspends itself to the top of the hive, or in any other position it may desire. I have already mentioned the basket-like provision on the hinder thighs of the *workers*—it is peculiar to, and characteristic of them.

To the superior portion of the thorax are attached four wings, consisting of two pair of unequal size. These wings are hooked

together, in order that they may act simultaneously, and not only serve to convey the insects from place to place, through the air, but by the humming, buzzing noise their motion produces, to give notice of their departure from, and return to, the hive, as well as possibly to animate their fellows in their mutual labors.

Interiorly, the thorax contains the œsophagus, or gullet, which traverses its extent on its way into the abdomen, where it dilates into, first, the honey-bag, which is furnished with two pouches posteriorly, and a muscular apparatus, by which it is enabled to give forth its saccharine contents; and, secondly, into the true stomach, in which digestion goes on for the nourishment of the insect, and the secretion of wax.

Next to the stomach is situated the sting: this consists of two darts enclosed in a sheath. The whole apparatus enters the wound, and the two small darts then enter still farther: these are barbed, and, on the insect withdrawing them, aid in widening the puncture, and thus afford greater room for the introduction of the poison. At the base of the sting, the bag containing the poison is placed; this fluid is, as already stated, an acid, but further than that it is so, has not been ascertained.

The bee respires by means of *spiracles*, or breathing-holes, situated in the thorax, beneath and behind the wings. Through these, air is admitted into the thorax, for the purpose of oxygenating the circulating system: for oxygen is no less essential to the well being of the bee—nay, to its very existence—than it is to that of man. Will not this convince every reader of the necessity which exists for duly ventilating the hives, or bee-boxes?—an operation so much neglected, and yet so important a feature, as I shall show hereafter, in the proper and remunerative management of these insects.

CHAPTER III.

ARCHITECTURE OF THE HONEY-BEE, AND ECONOMY OF THE HIVE.

WHEN a new swarm of bees establish themselves in a hive, or other receptacle, whether natural or artificial, their first proceeding is to cleanse the interior thoroughly, and carefully to stop up

every chink that might admit the weather: the substance which they employ for the latter purpose, and which likewise forms the basis of their comb, is called propolis, and is quite distinct from wax. Even the ancients appear to have recognized the distinction between wax and propolis; for Virgil particularly describes *two sorts of wax*, one of a character adapted for *smearing* (this was the true wax), the other for cementing or glueing—this was the substance we now know as propolis. This is a resinous substance of a greyish-brown color, and aromatic odor, and possessed of singular tenacity. Huber first showed that the bees collect this substance from the alder, birch, and willow trees, but especially from the *poplar*. A small filmy thread of the viscous produce of the tree is drawn off by the bee, and carefully kneaded into a ball by the action of the mandibles, after which it is secured in the *basket* which I have described as existing on the hinder legs: so tenacious is this substance, that on the laden bee's arriving at the hive, it requires the united efforts of many bees to disengage the load from the receptacle in which it has been placed; it also rapidly hardens; the bees, therefore, use it at once while it is yet fresh and plastic. It is with this substance, also, that the hive is attached to the stand on which it is placed, and with which the bees attach the comb to the hive: it is, however, of *wax* that the cells are formed.

To Huber we are indebted for having been the first to communicate to the world the mode in which the cells are commenced. He compelled the bees to *build upwards*, instead of allowing them to begin in the ordinary manner from above, downwards, and thus avoided the concealment of their work, attendant on their usual suspension from the top of the hive. A glass window did the rest.

Mr. Huber's discoveries are astonishing and interesting in the extreme. The combs formed by the bee, when permitted to follow its natural instinct, are commenced from the top of the hive, and consist of parallel plates of comb, having cells on both sides, the one *base*, therefore, serving for both, which effects a great saving of material. The form of each cell is hexagonal, having six equal sides, with the exception of the uppermost row, the shape of which is an irregular pentagon.

Here we must pause for a moment to wonder and admire—to admire the extraordinary instinct the Almighty has implanted in the bodies of these little insects. The chief requisites to be looked

for in constructing the cells, would naturally be, economy of materials, of room, of labor, and the greatest possible quantity of internal space. M. De Reaumur employed the celebrated mathematician, Koënig, pupil of the no less celebrated Bernouilli, to ascertain what the measurement of the angles composing these prisms should be, in order to obtain the above requisites ; and the result of his calculations showed the exquisite nicety with which instinct enabled the bees to work. I shall explain in the words of Dr. Bevan :—

“ The partition which separates the two opposing rows of cells, and which occupies, of course, the middle distance between their two surfaces, is not a plane, but a collection of rhombs, there being three at the bottom of each cell ; the three together form in shape a flattened pyramid, the basis of which is turned towards the mouth of the cell ; each cell is in form, therefore, a hexagonal prism, terminated by a flattened trihedral pyramid, the three sides of which pyramid are rhombs, that meet at the apex by their obtuse angles.

“ The union of the lozenges in one point, in addition to the support which it is the means of affording to the three partitions between opposing cells, is also admirably adapted to receive the little egg, and to concentrate the heat necessary for its incubation. Each obtuse angle of the lozenge or rhombs forms an angle of 110 degrees, and each acute one an angle of about 70 degrees. M. Maraldi found, by mensuration, that the angles of these rhombs, which compose the base of a cell, amounted to 109 degrees and 28 seconds, and 70 degrees and 32 seconds ; and the famous mathematician, Koënig, pupil of the celebrated Bernouilli, having been employed for that purpose by M. Reaumur, has clearly shown, by the method of infinitesimals, that the quantity of these angles, using the least possible wax, in the cell of the same capacity, should contain 109 degrees 26 seconds, and 70 degrees and 24 seconds. This was confirmed by the celebrated Mr. Mac Lauren, who very justly observes, that bees do truly construct their cells of the best figure, and with the utmost mathematical exactness.” It will be seen, then, that, in their architecture, the bees obtain the requisites which I above enumerated.

Perhaps the following is the most wonderful of Huber’s discoveries : *The design of every comb is sketched out, and the rudiments laid by one single bee*, who forms a block from a rough mass of wax, from materials furnished him by hosts of industrious

workmen ; determines the relative position of the combs, and their distances from each other ; attaches the blocks to the hives, and then leaves his inferior architects to go to work, and form the cells. One bee does not complete any cell ; but these insects relieve each other in succession, to the number of from fifteen to twenty, until the last finishing polish is given to the work. The cells designed for the drones are built with due reference to their superior size, and are usually near the bottom of the combs. The royal cells are built last, are usually from five to ten in number, and placed near the centre of the hive : these are designed as receptacles for the infant queens. I should not omit observing, that, while one set of workers are forming the comb and cells, another set are busy flying to and fro, collecting materials, and bringing them to the hives. Nor do they furnish their architectural brethren with materials only ; they supply them with food also, and with the sweets from which they likewise elaborate wax in their interior.

The royal cells differ in form and dimensions from the others. They are much larger ; more wax is expended on their formation ; their form is not hexagonal, but an oblong spheroid ; the mouth, which is at bottom, is left open until the grub is ready to undergo its transformations, when it is closed like the rest ; and immediately on a perfected queen emerging from her cradle, it is destroyed, and its site built upon with common cells. Nor are the royal cells built in among the other cells, but attached to them externally, suspended perpendicularly, with their sides parallel to the orifices of the common cells.

The bees occasionally depart from the regular form of their cells, and in doing so exhibit something so nearly resembling design as to become absolutely startling to the observer. These deviations appear when, after having formed a number of small cells, the bees wish to form larger ones—they may be termed cells of *transition* ; their bases are composed of *two* rhombs and *two* hexagons, instead of *three*. Reaumur and others have regarded this departure from regularity as a proof of imperfection. Dr. Bevan justly looks upon it as “determined by a sufficient motive,” and forming “no impeachment of the sagacity of the bee.”

The cells are by no means used indiscriminately for all the purposes of the hive : there are, on the contrary, as I have shown, cells peculiar to the royal brood : there are also cells peculiarly

kept for the young workers, and others for the young drones—these latter are much less numerous than those of the former: there are likewise cells reserved for containing honey. It is true that, when the breeding season terminates, the cells of the drones and workers are generally well cleansed out, and these also employed as receptacles for honey, but the honey preserved in them is never so pure or fine in quality as that which has been kept in its own peculiar storehouses: some of the cells are also kept apart for holding pollen; these are of large size. Pollen is not, as Reaumur erroneously conceived, the sole substance on which depends the formation of wax—if, indeed, it have anything at all to do with that process. It is eaten by the bees, forms a large portion of the food for the young, and may possibly thus lend its quota of assistance to the general elaboration.

To give some idea of the extreme thinness of the walls of the cells, I may mention that two of them laid together are not equal in thickness to a leaf of ordinary letter-paper; yet not only are they first formed, independent and sufficiently strong, of wax alone, with a basis of propolis, but are likewise subsequently coated over with a mixture of propolis and wax. The soldering at the orifice of each cell is formed with a large proportion of propolis; according as each cell is filled with its appropriate contents, it is carefully covered in.

CHAPTER IV.

GENERATION OF THE HONEY-BEE.

As soon as the severity of winter has passed away, and the genial influences of spring have begun to be felt, the queen-bee commences laying; and a hive, however it may have lost in number during winter, will by the middle of summer be crowded to excess, and, unless properly managed, throw off a swarm. The queen continues to lay until about September, and as she is calculated to deposit nearly 200 eggs per day, my readers may form some idea of the prodigious number she deposits in an entire season. This has by many authors been calculated at from 8,000 to 10,000, which I think much under the mark.

Wherever the queen-bee moves, she is attended by ten or a

dozen workers, who watch her every motion apparently with the utmost attention. Previous to depositing the egg, the queen puts her head into the cell for a moment, as if to ascertain its emptiness and fitness otherwise to receive its charge. If she find everything satisfactory, she then turns round, introduces her posterior extremity until it almost touches the bottom of the cell, and lays the eggs. Mr. Wildman says, that while thus occupied, the attendant bees, surrounding her in a circle, perform a sort of obeisance, and caress her with their feet and trunks. I am disposed to think this a little fanciful; I have never witnessed any such demonstration myself, but it is possible that my observation may have been defective. When she has deposited one egg, she goes on to another cell, and so on, and after laying about ten eggs in succession, she retires for awhile, and then resumes her prolific employment. The egg remains without undergoing any apparent change for about four days, when it gradually assumes the form and aspect of a little maggot, changing in the same manner as the caterpillar. This little maggot is nourished by the bees until the eighth day, by which time it has grown so much as to occupy the whole cell, when they close up the cell, and imprison its inmate for about twelve days more, during which time it undergoes gradual transformation until it becomes a *nymph* or *aurelia*, presenting the appearance of a perfect fly, except in being soft and white in color.

The white pellicle which envelopes the nymph now gradually strips off, and about the twentieth day the perfect fly is ready to attempt extricating itself from its confinement. This object she speedily attains by cutting round the *cover* with her mandibles.

On first emerging from the cell, the young bee appears weak and lethargic, doubtless from the novelty of its situation and the effects of the new medium by which it is surrounded. It soon, however, acquires vigor, and the very first day of its entrance into the world it may be seen returning from the fields, emulating its elder born comrades in the richness and quantity of the sweet burden with which it is laden.

As soon as the young bee has left the cell, two workers come to it, one of which draws out and works up the wax of which it was composed, while the other repairs it, restores its symmetry, and cleans out its interior. Sometimes new eggs are deposited in these cells the same day, and sometimes they are filled with

honey or farina. When five days old, the young bee, if a queen, is ready to commence the office of a mother.

In the event of the eggs being designed to produce drones, their changes present precisely the same phenomena as in the case of workers, except that they take more time, requiring twenty-four days for the change. Huber states that the eggs of the males require eleven months to be perfected in the ovaria of the queen, and assigns this as a reason why the eggs of workers continue to be deposited for eleven months before the queen commences depositing those of Drones. There are, however, some facts which at least throw some doubt on this suggestion; among others, that if a young queen be not impregnated within twenty days after her emergence from the cell, all her subsequent progeny will be drones, and drones only. I am not aware that any naturalist has yet attempted an explanation of this very remarkable fact. The eggs of the queen differ in no respects, when laid, from those of workers or drones, but they are deposited in peculiarly formed cells, already described; but when the larva appears on the fourth day, and from that time, extraordinary attention is bestowed upon it, and it is fed upon a peculiar substance, a sort of rich jelly of an acid character. In five days the royal larva commences forming her web, and the nurses close up her cell. In four and twenty hours she has completed her cocoon, in which state she remains for nearly three days. She is then *pupa aurelia* or *nymph*, and after five or six days more the royal insect is perfect. The young queen does not, however, like the other bees, begin at once to extricate herself from her cradle; her cell is, on the other hand, now more securely fastened than ever. But one reigning monarch is permitted to exist in the hive, and it is only in the event of the old queen dying, or issuing forth with a swarm, that the young aspirant to the throne is discharged from captivity. So strong is the instinct which prompts the bees to permit but the presence of a single sovereign in each hive, that the old queen makes frequent attempts to get at the royal cells; if she succeed in doing so, she will rend them open, and furiously destroy their contents; and the moment a young queen is suffered to depart from her cell, her very first act is to destroy her yet unreleased, and often undeveloped, royal sisters. It occasionally happens that two queens emerge at the same time; when this occurs a mortal combat ensues, which only terminates in the death of one of the combatants—

the workers meanwhile looking quietly on, not only not interfering to put a stop to the conflict, but actually, should one or both appear anxious to give up the struggle, hemming them round, and will permit of no compromise, but compel the rivals to bring the affair to a deadly issue. It very rarely happens that both queens perish in the encounter, for such is their instinctive dread of leaving the community unprovided with a sovereign, that should they, in the engagement, get into such a position in reference to each other, as would permit of mutually plunging their stings into each other's bellies, the only point where they are vulnerable, they hastily disengage, and do not use their stings unless when one queen can take the other at a disadvantage. Even, however, should such a casualty occur as the death of both queens, or should any other accident occasion a hive to be deprived of its queen, the bees possess a most wonderful power of supplying the deficiency.

The bees do not at once discover the loss of their queen, but when they do, all is tumult and confusion, these insects humming loudly, and hurrying hither and thither over the combs in a state of apparent distraction. If there be any royal nymphs ready to be released, one is at once set free—if only royal larvæ exist, their attention is at once devoted to them; but now comes the wonderful portion of the matter. If the bees possess only the larvæ of *working bees* they at once enlarge their cells, converting them into royal cradles, for which purpose they pull to pieces whatever cells are in the way, unhesitatingly sacrificing life after life to the great end they have in view: these larvae, by peculiar feeding, become converted into *queens*. It was that close observer, Schirach, who first made this singular discovery, the truth of which was subsequently confirmed by Huber. I quote his account: “I put some pieces of comb, containing worker's eggs in the cells, of the same kind as those already hatched, into a hive deprived of the queen. The same day several cells were enlarged by the bees, and converted into royal cells, and the worms supplied with a thick bed of jelly. Five were then removed from these cells, and five common worms, which, forty-eight hours before, we had seen come from the egg, substituted for them. The bees did not seem aware of the change; they watched over the new worms the same as over those chosen by themselves; they continued enlarging the cells, and closed them at the usual time. When they had hatched them seven days,

we removed the cells to see the queens that were to be produced. Two were excluded, almost at the same moment, of the largest size, and well formed in every respect. The term of the other cells having elapsed, and no queen appearing, we opened them. In one was a dead queen, but still a nymph; the other two were empty. The worms had spun their silk cocoons, but died before passing into their nymphine state, and presented only a dry skin. I can conceive nothing more conclusive than this experiment. It demonstrates that bees have the power of converting the worms of workers into queens, since they succeeded in procuring queens by operating on the worms which we ourselves had selected."

Huber likewise proved by experiment that the working-bees occasionally become endued with fertility, this taking place only in hives which have been deprived of their queen, and altogether he came to the conclusion that a development of the ovaries can be given to any bees by feeding them on the *royal food*, a wonderful provision, by which nature has secured the industrious inhabitants of the hive from the effects of unexpected contingencies, which would otherwise be attended with disastrous results.

"When bees," says Huber, "give the *royal treatment* to certain worms, they, either by accident, or by a peculiar instinct, the principle of which is unknown to me, drop some particles of royal jelly into cells contiguous to those containing the worms destined for queens."

It will occasionally happen, however, that a queen is lost when no eggs of any kind in a fit state of transformation exist in the hive. When such is the case, the bees discontinue the collection of honey; live riotously on whatever is left in the hive, while that lasts; fly about with no apparent object, and soon either perish or seek a home elsewhere. If, however, they be supplied with a new queen, they revive; but if they appear much reduced in numbers, it is better to join them to another stock.

It has been suggested that this power possessed by bees of manufacturing queens in cases of necessity, might be taken advantage of for the purpose of forming artificial stocks. I do not, however, see either the necessity or utility of so doing. One strong stock is ever worth three weak ones; and *union not scattering*—giving the bees plenty of house-room, according as they may require it, instead of partitioning them into insignificant and feeble colonies, is the only line of conduct towards them that

may be expected to keep the hive wealthy, and consequently bring profit to its human proprietor.

CHAPTER V.

POSITION OF THE APIARY.

THE most favorable aspect for your hives or boxes is south-westerly ; but if you can so contrive as to reserve to yourself a power of modifying this aspect with the season, so much the better. In spring, for instance, the aspect would be improved by inclining more to the west ; in autumn the reverse. My reason for this recommendation is, that the *morning* sun is prejudicial to the interests of the hive, not from any inherent bad quality in its rays, but because when the bees are so placed as to receive the early light, they are tempted forth too early—an event objectionable on two accounts ; first, that, especially in early spring, the dawn is *too cold*, and will occasion the death of numbers if they are induced to venture forth ; and secondly, because the bees, if they commence operations so early, become wearied before they have performed a good day's work, and the afternoon is a more advantageous period for their labors. I shall afterwards treat of "*shifting*"—a subject which has produced considerable controversy among bee-fanciers.

The place where you intend to fix your stand must be a dry soil—if sandy, so much the better. It should slope towards the front, in order to carry off the surface water produced by occasional rains, and should not, on *any account*, be exposed to the droppings from the eaves of houses, or even hedges. Shelter is essential, especially behind, and on the east of the hives, a house or high wall is the best you can procure ; and I am also an advocate for the stand being placed in a sort of small, open shed, well painted on the outside to protect it from the weather ; a few shrubs planted about the stand are also good as additional shelter. Some recommend high trees for the purpose of keeping the air calm, lest the bees should be blown down when returning home. *High trees* are not advisable ; they form an evil themselves of greater magnitude than that which they may be designed to remove. Bees are seldom blown to the ground by mere

wind ; but even when they are, they can, in a great majority of cases, recover themselves. Whereas, if blown amongst *trees*, they will be sure to be *whipped* so violently by the branches, that they are absolutely *hurled* to the ground with such force as to render their recovery hopeless. The bees also fly *low* on their return, when they arrive at the immediate neighborhood of their stand, and, consequently, high trees would be not only useless, but absolutely inconvenient. Whatever trees you wish, therefore, to plant in the immediate vicinity of the hive should be of low size. Wildman recommends them—and I think very judiciously—to be “of the dwarf kind, with bushy heads, in order that the swarms which settle on them may be more easily hived.” Now although by judicious management swarming will generally be prevented from taking place, yet despite of our utmost care it may accidentally occur ; or the bees may quit their boxes in a body, from various causes—some of which I shall endeavor hereafter to explain—and under such circumstances, Mr. Wildman’s suggestions will be found valuable. The garden, therefore, in which you fix your stands should be thus planted ; and I further, for the same reasons, recommend *wall* fruit trees and espaliers.

Avoid a site near mills or other noisy places, or the neighborhood of bad smells, as factories and the like ; and if, as occasionally may happen, your stand be placed against your garden wall, behind which is the farm-yard, let not a dunghill be built *against the opposite side*. I have witnessed this before now, and in one instance found the consequence to be a desertion of the boxes. Do not place your stand where you see rat or mouse holes, and let your shed be all of *wood*, never thatched with straw, as that substance harbors mice, moths, and other similar enemies to your stock.

Water is essential to the well-being of your bees ; it must, however, be presented to them judiciously, or it will prove a greater evil than a good. If you can coax a shallow rippling brook through your garden, so much the better ; if not, place near the stand, small, shallow, earthen pans of water, and put some pebbles in them. This water must be changed daily. It is highly objectionable to have a pond or canal in your neighborhood : you will lose thousands of your bees through their means every season, as they will be constantly blown into them when returning heavily laden to the hive, especially in the evening, when wearied after the toil of an industriously-spent day. The pebbles in the trough are for the bees

to rest on while drinking, and are the recommendation of Columella. I have seen tin plates perforated with holes, and placed over the pans, just on the surface of the water, used for drinking-vessels for bees; I, however, prefer the pebbles.

It is essential that you have your gardens abundantly planted with such shrubs and flowers as afford honey, in order, as much as possible, to prevent the necessity of your bees constantly traveling to an inconvenient distance in search of food. It will be as well also that you contrive to have a *succession* of such food, adapted to the season, a matter comparatively easily managed and of very great consequence to the well-being of your stock. Among these plants I may enumerate broom; furze or gorse; thyme, especially lemon thyme; clover; crocus; heaths; fruit-trees; mustard; mignonette; sage; single roses; radishes; primroses; privet; parsley; pease and parsnips; marigolds; violets; lily; laurustinum; daffodils; celery; cauliflower; asparagus; sunflowers, &c. Mr. Nutt has given a very copious list of bee flowers in his work on bees, but I think many of them might be omitted without any loss. Mr. Briggs, a most enthusiastic bee-fancier, mentions also as good bee-flowers—*phacelia tenacitifolia*; *salvia nemorosa*; *lithrum salicaria*; *winter aconite*; *hepatica* and wall-flowers; borage, winter vetches, ivy, a few perches of turnips *running to seed* in spring, and a succession of crops of buckwheat during summer and autumn. Mr. Briggs also mentions a plant so very valuable to bees that it is only a pity it is not more generally known, viz., *MELILOTUS LEUCANTHA*, which, with *BORAGE*, he seems to think the most important of bee-flowers. Mr. Briggs adds that the former, for bee purposes, "should be sown in March or the beginning of April, on a deep, rich, and dry loamy soil, in drills about eighteen inches apart, and the plants thinned to nine or ten inches' distance from each other. It will grow from six to eight feet in height during the first summer, and from ten to twelve during the second. If some plants of it are cut down to the ground, when about two feet in height, they will bloom later in the summer—a succession of them may be had from June to November, and they will be frequented by thousands of bees during every fine day throughout the season. Mr. Briggs has, with unusual generosity, distributed quantities of this valuable seed to bee fanciers, so that there can be no difficulty in obtaining it.

While I recommend the sowing of such seeds as will produce

plants beneficial and grateful to the bees, I have also to observe that there are plants which prove noxious to them or to the consumers of their produce ; sometimes to one, sometimes to both. Xenophon mentions, in the *Anabasis*, that soldiers of his army were poisoned by honeycomb they found near Trebizond ; and M. Tournefort, a traveler through that country, discovered a plant called "chamærhododendron, mespili folio," a plant closely resembling the *honeysuckle* in smell, which produced effects identical with those described by Xenophon, namely intoxication, vertigo, stupor ; the men affected recovering from their illness in about three or four days.

Recollect also that your hives should on no account be so placed as to be exposed to the noonday sun—this will injure the honey and melt it, and will raise the temperature of the hive so as to produce unwished-for swarming, besides otherwise annoying and injuring the bees. A few shrubs, therefore, should be so placed as to cast their shadow across your stand during the heat of the day ; you may also let these shrubs be of such a description as the bees are fond of—you will thus effect a double object ; and you may also dispose them tastefully, so as to give your apiary a pleasing and picturesque appearance.

Finally, I object to *bee-houses*, whose chief recommendation is set forward as consisting of their capacity for containing a *great number* of hives—these are only fit for keeping the bee-boxes in during winter—one, two, or three sets of collateral boxes are as many as any moderate bee-keeper will desire, or be able conveniently to attend, and these can be kept, each in a little shed by itself. Beehives should never be placed *close* to each other, as they must necessarily be in these houses, for bees are naturally very irritable and pugnacious insects, and if two colonies be kept too near each other, battles will ensue, and the weaker hive be destroyed. If you persist, therefore, in using hives, at all events let them be at least three feet apart—but I shall show you in the next chapter, how you can make for yourselves collateral boxes, sufficient for success, and for so little money, if indeed you are called upon for *any* outlay, that I think I shall be able to wean you altogether from the old and unprofitable straw basket.

CHAPTER VI.

HIVES AND BOXES.

THE old straw, conical-shaped hive is too well known to need description, and is too unprofitable to be worthy of it. I may merely observe, that its mode of management was simple enough, consisting only in leaving the bees to themselves until autumn, then inserting brimstone matches into the hive, suffocating its miserable inhabitants, and taking, perhaps, 15 or 16 lbs. of very bad honey, smelling foully of sulphurous acid gas, and full of the dead bodies of its ill-requited producers. When, about midsummer, the temperature of the hive increased to such a degree as to become insupportable to the inmates, they *swarmed*, as it was called, that is to say, the queen took her departure, accompanied by a certain number of her subjects, to seek a more roomy residence.

The main objections to this old system of management are, its *inhumanity*, its *absurdity*, and its *unprofitableness*. What could be more inhuman than killing the poor things *unnecessarily*, for the sake of their produce? What would be said, did we kill the cow for her milk, or calf, or the hen for her eggs? Indeed, to nothing can I compare this practice more aptly than to the man in the old fable, who killed and cut open his goose, in order to come at her golden eggs. What can be more absurd than to destroy in mere wantonness the lives of multitudes of creatures that, if permitted to live, would be ready to resume work for you the following spring? and in what is its absurdity shown so plainly as in its unprofitableness? What signify ten or fifteen pounds weight of honey, or even thirty pounds weight to be produced by a single stock in a season—and that, too, when 100 lbs. weight will be furnished, provided only that you take advice—and that honey, moreover, of superior quality, pure, crystalline, and limpid?—very unlike the foul produce of a dirty straw hive, copiously clogged with the bodies of your murdered benefactors.

The chief objects to be effected by the use of a suitable receptacle for your bees are—

First—The power of depriving your bees of their honey at pleasure, and without injury to them.

Secondly—The obtaining it in its pure and uncontaminated form.

Thirdly—The means of enlarging their accommodation when necessary, and the consequent prevention of swarming.

These requisites have been recognized for a great many years back; and the humane system of management so enthusiastically promulgated and insisted upon by the late Mr. Nutt, is by no means novel, as it is identical in principle with that described by bee-fanciers who lived more than half a century before him. As Mr. Nutt's hive is in more fashionable repute at present than any other with which I am acquainted, I shall give it the precedence in order of description; I shall quote Mr. Nutt's own description, from his very interesting work.

"There has been some difference of opinion as to the most suitable dimensions for bee-boxes. I approve of and recommend those which are from eleven to twelve inches square inside, and nine or ten inches deep in the clear.

"The best wood for them is, by some, said to be red cedar; the chief grounds of preference of which wood are, its effects in keeping moths out of the boxes, and its being a bad conductor of heat. But of whatever kind of wood bee-boxes are made, it should be well seasoned, perfectly sound, and free from what carpenters term *shakes*. The sides of the boxes, particularly the front sides, should be, at the least, an inch and a half in thickness; for the ends, top, and back part, good boards one inch thick, are sufficiently substantial; the ends that form the interior divisions and openings must be of half-inch stuff, well dressed off, so that, when the boxes and the dividing tins are closed—that is, when they are all placed together, the two adjoining ends should not exceed five-eighths of an inch in thickness. These communication ends, the bars of which should be exactly parallel with each other, form a communication or division, as the case may require, which is very important to the bee, and by which the said boxes can be immediately divided, without injuring any part of the combs, or deluging the bees with the liquid honey, which so frequently annoys them, in extracting their sweets from the piled or storified boxes. This is not the only advantage my boxes possess: the receptacles, or frame-work, for the ventilators, which appear upon each side of the end boxes—the one with the cover off, the other with it on—must be four inches square, with a perforated flat tin, of nearly the same size; and

in the middle of that tin must be a round hole, to correspond with the hole through the top of the box, in the centre of the frame-work just mentioned, an inch in diameter, to admit the perforated cylinder tin ventilator, nine inches long. This flat tin must have a smooth piece of wood, well made to fit it closely, and to cover the frame-work just mentioned, so as to carry the wet off ; then placing this cover over the square perforated tin, your box will be secure from the action of wind and rain. The perforated cylinder serves both for a ventilator, and also for a secure and convenient receptacle for a thermometer, at any time when it is necessary to ascertain the temperature of the box into which the cylinder is inserted. Within this frame-work, and so that the perforated flat tin already described may completely cover them, at each corner make a hole with a three-eighths centre bit, through the top of the box. These four small holes materially assist the ventilation, and are, in fact, an essential part of it.

" We next come to the long floor, on which the three square bee-boxes which constitute *a set*, stand collaterally. This floor is the strong top of a long, shallow box, made for the express purpose of supporting the three bee boxes, and must of course be superficially of such dimensions as those boxes, when placed collaterally, require ; or, if the bee boxes project the eighth part of an inch over the ends and back of this floor box, so much the better ; because the rain or wet that may at any time fall upon them will drain off completely. For ornament, as much as for use, this floor is made to project about two inches in front ; but this projection must be sloped, or made an inclined plane, so as to carry off the wet from the front of the boxes. To the centre of this projecting front, and on a plane with the edge of the part cut away for the entrance of the bees into the pavilion, is attached the alighting board, which consists of a piece of planed board, six inches by three, having the two outward corners rounded off a little. The passage from this alighting board into the pavilion is cut, not out of the edge of the box, *but out of the floor-board*, and should be not less than four inches in length, and about half an inch in depth, or so as to make a clear half inch way under the edge of the box for the bee passage. I recommend this as preferable to a cut in the edge of the box ; because, being upon an inclined plane, if at any time the wet should be driven into the pavilion by a stormy wind, it would soon drain out, and the

floor become dry; whereas, if the entrance passage be cut out of the box, the rain that may, and at times will be, drifted in, will be kept in, and the floor be wet for days and perhaps for weeks, and be very detrimental to the bees. In depth, the floor-box, measured from outside to outside, should be four inches, so that, if made of three-fourth-inch deal, there may be left for the depth of the box part two inches and a half. Internally it is divided into three equal compartments, being one for each bee-box. Admission to these compartments, or under boxes, is by the drawer, or drawer-fronts, or blocks, which will be described presently.

“The bottom, or open edge of each of the boxes, should be well planed, and made so even and square, that they will sit closely and firmly upon the aforesaid floor, and be as air-tight as a good workman can make them, or technically expressed, be a *dead fit*, all round. In the floor-board are made three small openings, *i. e.*, one near the back of each box. These openings are of a semilunar shape (though any other shape would do as well), the straight side of which should not exceed three inches in length, and will be most convenient, if made parallel with the back edge of the box, and about an inch from it. They are covered by perforated, or by close, tin slides, as the circumstances of your apiary may require. The drawer, the front of which appears under the middle box, is of great importance, because it affords one of the greatest accommodations to the bees in the boxes. In this drawer is placed, if necessity require it, a tin made to fit it, and in that tin another thin frame, covered with book muslin, or other fine strainer, which floats on the liquid deposited for the sustenance of the bees. Here, then, you have a feeder, containing the prepared sweet, in the immediate vicinity of the mother hive, and without admitting the cold or the robbers to annoy the bees. When you close the drawer thus prepared with bee food, you must draw out the tin placed over the semilunar aperture, which will open to the bees a way to their food in the drawer beneath. The heat of the hive follows the bees into the feeding apartment, which soon becomes the temperature of their native hive. There the bees banquet on the proffered boon in the utmost security, and in the temperature of their native domicile. Under such favorable circumstances, it is an idle excuse, not to say a want of humanity, to suffer your bees to die for want of attention to proper feeding.”

The box fronts on each side of the feeding drawer are formed of a bit of talc suspended over a hole on the outside, thus permitting egress, but precluding ingress. By means of this contrivance you are enabled to add to the number of your bees, without alarming or annoying them, and they can likewise escape when you are depriving them of one or the other of the collateral boxes. This contrivance further precludes the intrusion of insect enemies.

The centre is perforated on the top, and over the hole a bell glass is placed, which, when the hive is filled, the bees fill with honey, and it is unnecessary to add that this honey is of the very purest description. Wooden fittings or covers are provided for the protection of these glasses.

The bees being placed in the centre box, or pavilion, soon commence operations, and speedily fill it with honey. When full, which you may ascertain by looking through a window fixed in the back of the box, you are to draw the tin slide which separates it from the bell glass ; this is best done on a warm day, and you should previously cut through the comb with a thin wire. Before taking off the glass the operator should pause for a few minutes, to observe whether there be any unusual stir among the imprisoned bees, for if they do not appear alarmed, the queen is among them, and, in that case, you should withdraw the slide, and postpone the operation to another day.

In taking away the glass, envelope it in a silk handkerchief, and remove it about ten yards from the boxes ; then place it a little on one side, so as to permit the imprisoned bees to escape, which they will do in the course of a few minutes.

When occasion requires, the bees are to be similarly admitted into the side boxes, by drawing the slides, but in removing one of these boxes some precautions require to be used. For instance, open the ventilator the night previous ; this will, by lowering the temperature of the hive, and admitting a current of air, induce the bees to leave the box thus treated, and to congregate in the pavilion. You may then put down the slide, and let the bees remain for ten minutes or so in darkness. If the queen be not in the box to be taken, any bees that may remain in it will be restless and in confusion. If she should be there, the commotion will be in the centre box. If the queen should be in the box you intend taking, draw up the slide again and she will soon leave it. Having emptied the full box, return it to its

place. In Mr. Nutt's system it will be perceived that *fumigation*, or *bee-dress* (hereafter to be described), are rendered unnecessary, and that even a child may manage his boxes with ease and safety.

The centre box, on account of its being the breeding place, is never to be meddled with.

"Weaken not its population, but support its influence, and extend it to those accommodations which no practice, except my own, has yet put into operation, or made provision for."

The value of Mr. Nutt's set of bee-boxes is unquestionable, but they are, at the same time, necessarily too costly to be within the reach of those whom Providence has not seen fit to bless with "golden store." Mr. Nutt's views, although possibly, as far as he himself is concerned, original, were entertained by bee-keepers many, many years before him. Among the rest, I may mention Wildman, who not only used *collateral boxes*, but even *bell glasses*, similar to those of Mr. Nutt; the Rev. S. White, and Madame Vicat. Mr. White evidently mismanaged his boxes, for the complaint against their utility was, that the queen laid her eggs promiscuously in all of them. This would have been obviated had he thought of Mr. Nutt's subsequent idea, viz., of reserving one box as the seat of generation, and separating it from the side boxes, until necessity called for junction, by tin sliders. Not only, however, must I pronounce Mr. Nutt's boxes an evident improvement upon those I have just mentioned, on the score of utility and completeness, but actually also on the score of simplicity, and the comparative facility with which they are consequently susceptible of being worked.

Any person of common ingenuity can form for himself a set of collateral boxes, by attending to the following directions:

Take as a stand a piece of strong board; let it be about four feet long, and about two feet wide, as thick as you can procure it; place it on four legs, and let the edge project over the legs, in order to prevent the incursion of insects; plane the upper surface smooth.

Make three boxes, each about ten inches square, with, of course, no bottom, and have the edges of the bottomless portion planed smooth, so as to lie as close as possible to the board. Cut away a portion of the bottom of one side of each box, and in that designed for the centre box, do so on two opposite sides—these are for communication. Get two sheets of tin, or

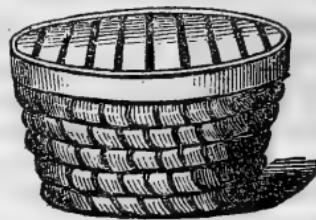
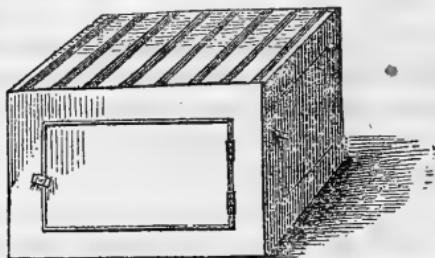
thin wood—a piece of a broken tea-chest will do admirably—and place one between each of the collateral boxes and the centre one, so as to cut off communication between them, until it is desired to open it, when of course one of them is withdrawn, and, at the same time, the side-box, thus opened, will be pushed close to the central one. Let the standboard be on an inclined plane, sloping towards the front, so as to throw off wet, and let the said board project a couple of inches, to serve the bees as a place on which to alight. You may make a small hole, about half an inch, or rather less, in diameter, in front of this centre box, partly in the box, and partly in the board, for the ingress and egress of its inhabitants. If the board have a proper inclination outward, there is no fear of any wet either penetrating or lodging. Paint your boxes externally, but do so a considerable time before you require to use them, and encompass them, with the best sort of rough shed that you can “knock up;” bore a hole, with a centre bit, in the top of each box, and place a glass vessel over it. When it is necessary to feed your bees, you can do so by attaching a feeder to the entrance door, and the holes for the bell glasses will afford you ample means of ventilating. In case they should not, however, you may have a hole at the back of each box, stopped with a cork, which you can withdraw for the admission of air when necessary. Take care, however, that you do not push the cork entirely through the wood of the box, or it will be so cemented by propolis, that you cannot, perhaps, draw it out without injury or disturbance to the combs. Such a set of boxes as I describe may be made easily enough, and for little or no cost, and will answer all purposes of utility, though, perhaps, deficient in *ornament*, as well as the most costly and elaborate.

Mr. Briggs, on the formation of bee-boxes, says :

“They should be chosen, or constructed, of as good quality as possible, so as to effectually preserve their contents from either extreme heat or cold, dampness, or any sudden changes of temperature.

“The size of the centre box should be about ten and one-half inches cube, inside measure; and it would be an advantage to have six bars fixed across the top of it, from front to back, which should be one and one-eighth inch in width, half an inch in thickness, and half an inch apart—the ends of each of which should be neatly rabbeted into the front and back of the box.

Over the bars should be laid a piece of thin gauze, and upon it the top or covering board of the box, which may have a circular hole in the middle of it, securely stopped by a good cork bung,



to be removed for the purpose of placing a small bell glass over the hole as occasion requires.

"The side boxes may be made and used of different sizes if desired, and to contain from 350 to 1100 cubic inches each. If the smaller sizes are adopted, the entrance to them must be along the hollow part of the bottom board; but it would be considered more complete to have the side boxes of the same width and depth as the centre one, and to have them well fitted and secured together during the honey-gathering season. The entrance from the centre to the side boxes may then extend along the under edges of each of them from front to back, and about three-eighths to one-half an inch in depth: there should also be a perpendicular one three inches long, and half an inch wide, up the centre of the end of each of the boxes, the upper part of which should reach to within three inches of the top of the box inside.

"The use of bars to the top of boxes is frequently of much service to the apiarian, as he can thereby occasionally remove a few of the old combs from the box, and can, at any time, have an opportunity of examining the state of the interior of the boxes. Before using a new box with bars, as above, a piece of pure and clean brood comb should be neatly fixed to each, or every alternate bar, which may be readily accomplished by the assistance of a long and smooth piece of heated iron—the comb being rubbed for a few seconds on the iron, should immediately be applied to the bar, and will then, in a short time, firmly adhere to it.

"The use of hives of straw is by many persons still continued and approved; and I have no doubt, that when they are pro-

perly made, and judiciously managed, according to the directions previously given, the returns from them will often equal, or surpass, those from some of the more fancy-shaped and expensive wooden boxes.

“ The size of straw hives should be from sixteen to seventeen inches in diameter, and twelve to thirteen inches in height; and they should have a narrow, flat, and thick top of wood, with a circular hole and cork bung in the centre of it, similar to that which is recommended for wooden boxes.

“ The outer box, in which the stock-hive and side boxes are enclosed, having been made wider than the interior hives or boxes, should have a partition from front to back, on each side of the stock-hive, and the interstices round the centre hive filled up with dry sawdust, powdered charcoal, or other suitable materials, which will be of service in preserving the temperature of the hive in a congenial and uniform state.

“ I have above stated that the communication from the straw stock-hive to the side boxes should be along the hollow centre of the bottom board; and I recommend that three or more circular holes be made in the bottom board on each side, in such a manner that each of them may be covered with a bell-glass, or that one of the larger side hives or boxes may be placed over them, as may suit the wishes or convenience of the apiarian.

“ When glasses are used, they should be well covered with some soft woollen materials, and a hive or box should then be placed over them to effectually exclude the light, and preserve them from accidents of any kind, and sudden changes of temperature.

“ It is advisable to have the outer box well made, with a neat and substantial roof to carry off the wet, &c.; and it should be made of such breadth as to leave a space of one-half inch on each side of the stock-hive.

“ I would recommend, that if the bees are kept in a straw hive, that it be of a large size, and well made; and should be stocked with a strong swarm at the usual period of the year. It should then be placed on the centre of a stout bottom board, made long enough to hold a small hive or box on each side of it, and having hollow communications from the centre hive to the side ones, which can be opened or closed at pleasure. When the bees require room in the Spring or Summer months, the entrance from the centre to one of the side hives must be opened, and

after they have fairly taken possession of it, it must be properly ventilated by a hole previously formed on the top, and covered with a piece of perforated zinc, keeping the temperature between 65° and 75° of Fahrenheit's thermometer.

"The three hives should have a well made wooden covering over them, with a span-shaped roof to carry off the wet, &c., and an opening at the back for the purpose of examining the progress of the bees; the outer box should be well painted and waterproofed, and will greatly assist in regulating the temperature of the hives, and in protecting them from extreme cold, dampness, and sunshine.

"I would recommend a set of two or three of the improved collateral boxes, which may be made of well-seasoned boards, about ten and a half inches cube, inside measure, and to be neatly fitted together, with convenience for ventilation and inspection, and they must also have a wooden covering over them, with an opening at the back, similar to the one above mentioned.

"The outer box should be one inch, or one and a half inch wider inside than the outer dimensions of the interior boxes.

"By constructing boxes on the above plan, the swarming of the bees may be, by judicious management, for a time prevented, but it is not recommended that that propensity should be entirely defeated, as a swarm may be occasionally taken from collateral boxes with advantage to the swarm and to the stock hive.

"By proper attention, large quantities of pure honey may be obtained by the above system of management. Last year, a friend in this vicinity obtained 109, 97, and 89 pounds of pure honeycomb from three sets of Nutt's collateral boxes."

Mr. Taylor, in his "Beekeeper's Manual," speaks as follows of bee-boxes:—

"It matters not much of what wood the boxes are made, provided it is sound, thoroughly seasoned, and well put together. Different opinions are entertained as to the best size of bee-boxes, but I think that much must depend on the number of bees they are to contain, and on the honey locality; there must also be a reference to the proposed mode of working them, for, where no swarming is permitted, a larger hive may be advantageously used. A good size is twelve inches square, and nine inches deep within, the thickness throughout being not less than an inch. The top of the box ought to project on all sides nearly three-quarters of an inch, for better protection and ap-

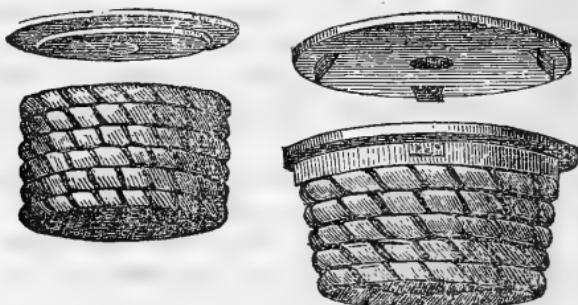
pearance, and as affording convenience for lifting. On the top, a two-inch hole should be cut in the centre, for placing a bell-glass, and for the purpose of feeding; and another hole to receive a ventilator may be made near the back window, that position being better for inspection, and less in the way of the bees, than the centre of the hive, which is, or ought to be, the seat of breeding, and should not be disturbed. A window may be placed at the back and front, five inches high, and six or seven inches wide. The best and neatest way of securing the windows, that I have seen, is by a sliding shutter of zinc. Round the window, there must be a projecting moulding, mitred at the corners. On one side, the piece of moulding is movable, and to the back of this is screwed a plate of sheet zinc. This passes into a rabbet to receive it, cut, on the remaining three sides, at the back of the lower edge of the moulding. To prevent any wet from lodging at the bottom moulding, an opening or two may easily be cut through, on the under side, to allow its escape. For the sake of uniformity of appearance, blank windows may be made opposite to the real ones. Hives of this kind require to be placed under some cover or shed, as a protection from wet, and a hot sun."

It will not, I am sure, be deemed amiss that I here supply my readers with an account of the "Leaf Hive" invented by the celebrated Huber, and designed by him to furnish all the requisites for which Mr. Nutt produced his collateral boxes:—

"This hive," says Huber, "consists of eight frames, each eighteen inches high and ten inches wide inside, having the uprights and top cross pieces one and a half inch broad, and one thick, so that the eight frames, when placed close together, constitute a hive eighteen inches high, twelve inches between end and end, and ten inches between back and front, all inside measure. The frames are held together by a flat sliding-bar on each side, secured by wedges and pins. To the first and eighth of these frames is attached a frame with glass, and covered with a shutter. The body of the hive is protected by a sloping roof, and the entrance is made through the thickness of the floor-board. We dislike the sliding-bars, with their pins and wedges, which are so far inconvenient, that, in drawing them out, all the frames are liable to open, and the observer is exposed to some hazard of annoyance, from the bees issuing out at every joint: and we have substituted for them hinges on one side, and a hook-and-eye on

each frame on the other ; we can thus open any particular leaf without meddling with the rest. In taking honey from this hive, the bee-master has the whole interior completely under his eye, and at his disposal, and can choose what combs best suit his purpose, both as to quantity and quality ; taking care, however, to do so only at such periods as will leave the bees time to replenish the vacancy before the termination of the honey season. It is also well adapted for artificial swarming. By separating the hive into halves, the honey, brood-combs, and bees will, generally speaking, be equally divided ; and by supplying each half with four empty frames, we shall have two hives, one half empty, equal in number of bees, of brood, and even of stores. One of the new hives will possess the queen ; and if the operation has been performed at the proper time—that is to say, a week or ten days before the period of natural swarming—the probability is, there will be a royal brood coming forward in the other ; at all events, there will be plenty of eggs and larvæ of the proper age for forming an artificial queen."

Cheapness, and an obstinate adhesion to the customs of our forefathers, induce straw hives still to be used by many. Mr. Briggs has already shown how they may, when necessarily or optionally employed, be rendered almost as productive as boxes. I add the following from Mr. Taylor, who objects to the use of sticks or *cross-pieces*, sometimes employed for the purpose of supporting the combs :—



"The sticks are only an annoyance to the bees ; and there is little fear of the combs falling, except in very deep hives ; at any rate, it may be prevented by contracting the lower part a little. The best way of doing this is, by working a wooden hoop inside the bottom band of the hive, as recommended by Dr. Bevan, who says, 'It should be perforated through its whole course,

and the perforations made in an oblique direction, so distant from each other as to cause all the stitches of the hive to range in a uniform manner.' The hoop gives greater stability to the hive, preserves the lower edge from decay, and affords facility in moving it. I advise a circular piece of wood (turned with a groove at the edge, to retain it in its place) to be worked into the crown, having through it an inch and a-half hole. With a little ingenuity, the bees may be fed through this opening—a better method than the ordinary one at the bottom of a hive. A piece of wood or tin will commonly cover the hole ; but at times, and especially in winter, it may be used for the purpose of ventilation, and allowing escape to the impure air of the hive. In this case, a bit of perforated tin or zinc should be placed over it, which, when stopped up by the bees, can be replaced by a clean one. An earthen pan is a common cover to a straw hive ; and this may be slightly raised by wedges on the four sides, to permit a small space underneath. Of whatever material the outer covering consists, it must project so far on all sides as to protect the hive from the least moisture. This cannot be too much guarded against ; and whether of wood or straw, all hives ought to be well painted at the beginning, and periodically afterwards."

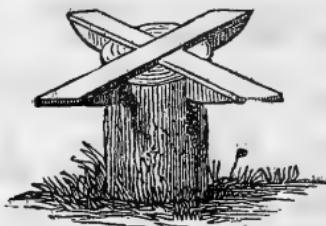
I can confidently recommend the following simple and cheap description of hive to my readers :—Get a common straw hive, but let it be of somewhat larger dimensions than are ordinarily used, and cut it across (about one-third of its length) from the upper or conical end ; fit to this end a round piece of wood, about an inch in thickness, having in its centre a hole about an inch and a half in diameter, fitted with a cork or bung. Take another hive of ordinary dimensions, and place it over this. This is called *capping*. When, during the proper season, the bees have filled the lower part of the hive, and show symptoms of requiring more room, you have only to draw out the cork, and place the cap over the board. This acts as a bell-glass ; and the honey you will collect in it will not be inferior to that procured from the most costly set of bee-boxes. A coating of Roman cement on the exterior surface of these hives, will render them almost everlasting.

De Gelieu states that he took 72 lbs. weight of fine, pure honey from a straw hive thus capped, in one season.

Glass, or, as they are called by some, "observatory hives," are not such as I approve of. Bees love darkness, and hate light

or observation. In a state of nature they are in the habit of seeking some hollow, vacant spot beneath a bank or rock, the cleft of a tree, or some similarly dark and secluded situation. The observatory hive is, then, foreign to the natural habits of the insects, and as such, of course, it is not to be recommended.

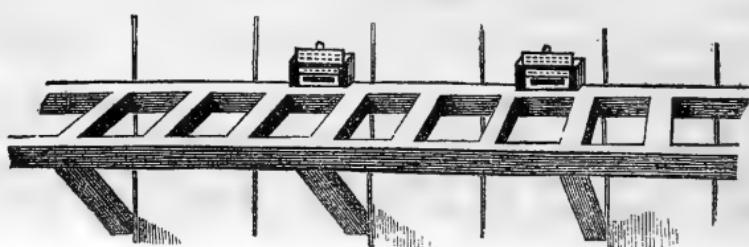
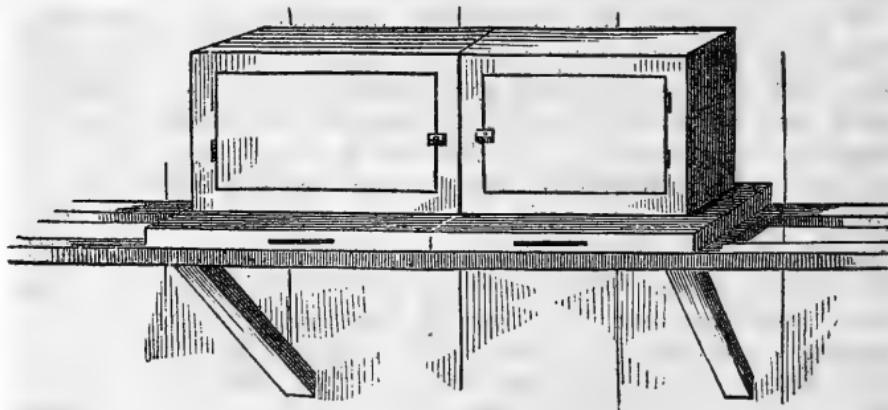
The accompanying cuts will give a good idea of stands for hives. This one is intended for the open ground. It is a post



set into the ground, with cross pieces let into it.



The annexed cuts show a frame-work for shelves, instead of



whole boards. These frame-works have the advantage of more firmness and the facility they afford for ventilation. On whole boards the hive must be elevated by bars, or holes be cut through the shelf.

CHAPTER VII.

HOW YOUR STOCK IS TO BE OBTAINED.

You may procure stock either in the spring or autumn. I should prefer the former period, because that is the fitting time for removal of stocks from the old-fashioned, awkward hives to the more improved modern receptacles; but it is more difficult to ascertain the exact condition of the stock you are about purchasing in spring than it is in autumn. I am sorry to say that unless you purchase your stock from a friend, or from some one, at all events, that you can confidently depend on, you are very likely to be taken in, and must, therefore, be upon your guard against imposition: as some writer—I forget who—quaintly enough remarks, “Let it be with the bees as with a wife, never *take them on the recommendation of another party.*” If you would purchase a stock in early spring, just after the bees have been removed from their winter quarters, you need not attempt it unless from a person on whose honor you can positively depend. If during the months of May or June, you can form some judgment for yourself, and if you act cautiously, may, perhaps, bid defiance to trickery: in this case you should visit the garden, or other locality, in which the hive stands that you intend purchasing, about mid-day; stand opposite to it, and observe attentively the actions of its inhabitants. If they crowd busily in and out of the hive, giving evidence of their industry by the laden appearance of their legs, and altogether exhibiting a busy *earnestness* in their toils, you may safely buy the hive; and if you obtain this hive before swarming has taken place, you may look upon yourself as a fortunate man.

If the object of your intentions be an autumnal hive, you had better ascertain that the massacre of the drones has taken place; an observation of the stand and of the ground around the hive will tell this. Observe the actions of these bees—see that they

are lively and industrious ; and if, on your too near approach, one or two bees dash at your face, do not be alarmed, but rather regard their pugnacity as a sign of vigor, and buy the hive. Some writers speak of the necessity of purchasing only such stocks as are in nice new hives. This is an advice very necessary to be attended to, but it would not be so, were you sure that the interior of the hive were filled only with honey-comb, and with no old, worn-out comb, the accumulation of years. If you are in doubt on the subject, you should *fumigate* the hive in the evening, in the manner hereafter to be described ; then, turning up the hive, you can readily ascertain the character of its contents. If the comb be black, have nothing to do with the stock. The genuine color of the comb is white, and, consequently, the lighter it is, the more the stock is to be esteemed.

Never, unless you can depend on the party, *send* your hive to receive a swarm ; for you may, if you do, have a *second* swarm imposed upon you for a *first*—a comparatively valueless stock for just the very thing you desire. The first swarm begin the formation of the combs at the *middle* of the apex of the hive ; the *second* does so at the *side*. These are the only criteria I can furnish, for neither weight nor bulk are to be depended upon. It is to the obstinate use of the old-fashioned hive that these difficulties, and these opportunities for fraud, are attributable. Were the improved system once established, these cautions would be no longer called for. Wildman has given some good advice as to the purchase of stocks ; and in this advice he speaks like an oracle. Attend to him :—

“ The person who intends to erect an apiary, should purchase a proper number of hives at the latter end of the year, when they are cheapest. The hives should be full of combs, and well stored with bees. The purchaser should examine the combs, in order to know the age of the hives. The combs of that season are *white* ; those of a former year are of a *darkish yellow* ; and when the combs are *black*, the hives should be rejected, because old hives are most liable to vermin and other accidents.

“ If the number of hives wanted have not been purchased in the autumn, it will be necessary to remedy this neglect after the severity of the cold is past in the spring. At this season, bees which are in good condition will get into the fields early in the morning, return loaded, enter boldly, and do not come out of the hive in bad weather, for when they do, this indicates that they

are in great want of provisions. They are alert on the least disturbance, and by the loudness of their humming we judge of their strength. They preserve their hives free from all filth, and are ready to defend it against every enemy that approaches.

"The summer is an improper time for buying bees, because the heat of the weather softens the wax, and thereby renders the comb liable to break, if they are not very well secured. The honey, too, being then thinner than at other times, is more apt to run out at the cells, which is attended with a double disadvantage—viz., the loss of the honey, and the daubing of the bees—whereby many of them may be destroyed. A *first* and strong swarm may indeed be purchased; and, if leave can be obtained, permitted to stand in the same garden until the autumn; but if leave is not obtained, it may be carried away in the *night*, after it has been hived.

"I suppose that in the stocks purchased, the bees are in the hives of the old construction. The only directions here necessary are, that the first swarm from these stocks should be put into one of my hives; and that another of my hives should, in a few days, be put under the old stock, in order to prevent its swarming again."

Nor can I very well leave Wildman, without saying something of the "Count de la Bourdonnaye," so frequently quoted by him in his "Account of Bees." M. de la Bourdonnaye is justly entitled to our gratitude and remembrance as the original inventor of the *caped* or capped hives; a most useful contrivance, and one which I have already described.

"Count de la Bourdonnaye's hives are made of straw, divided into two parts, which are placed one over the other. Each of these parts is thirteen inches in diameter in the inside, and twelve inches high; so that when joined, they make a hive twenty-two inches in height. They are nearly flat on the top, and have in the middle of the top a hole an inch and a quarter square. The upper half rests on the lower. They are made of sufficient thickness to be proof against cold, and not to be heated by the rays of the sun. When *united*, their joining is luted close."

So then the origin of our modern *caps* is to be referred to a period of upwards of ninety years ago! I may, however, observe that proper *fitting* of the upper portion, or cap, upon the lower portions or true hive will quite do away with the necessity of *luting*.

CHAPTER VIII.

SWARMING.

BEES multiply, during the breeding season, with astonishing rapidity; it is, therefore, not to be wondered at that the young brood should speedily produce *crowding* in the hive, thus becoming not only inconvenienced for room, but more than agreeably warm: it is also supposed that the queen becomes alarmed at the number and progress to maturity of the royal larvæ, which indeed she would fain kill, were not she prevented from doing so by the workers. While swarming is by no means to be *forced*, yet if symptoms of a swarm present themselves, early, say in April or May, you may permit it to take place—provided the parent stock be still sufficiently strong in numbers—otherwise it is of course highly disadvantageous to the well-being of the hive as well as to the emigrants. I disapprove altogether of late swarms, *i. e.*, allowing them to come off in July or August—hence the utility of such hives as place this circumstance under the control of the keeper.

The most certain indications of swarming are, the hive appearing full of bees—clusters of them gathering on the outside, and sometimes hanging from the alighting-board; they also neglect their daily toil and refrain from going abroad in search of sweets, even though the weather be ever so inviting. Just before they take flight the hive is hushed, the bees are silent and carefully loading themselves with provender for their journey. For two or three nights prior to swarming, you will also hear a peculiar humming noise within the hive; the second swarm is announced by a different sort of buzzing, being, according to some writers, the result of a contest as to which of the two queens shall lead off from the hive. It is the old queen who leads off the first swarm.

If a swarm be about to quit the hive, the slightest change of weather will prevent their doing so; but nothing so effectually as a shower of rain: hence an excellent mode of preventing it, when the bees cluster on the outside of the hive, by syringing them with water from a common metallic syringe. When a swarm leaves the hive, if it do not settle on some tree or bush, but remains in the air, and you fear its going off to too great a

distance, if not evading you altogether, you may bring it down by throwing up sand or dust, which the bees mistake for rain, or by firing a gun, which they mistake for thunder ; hence the old fashion of the country-people following a swarm with the noise of fire-shovels and frying-pans. You must be the more diligent in at once securing your swarm, for it is a fact that the bees send out scouts previous to swarming, whose duty it is to select a proper habitation for the colony. It is, on this account, a good plan, when you anticipate a swarm, to leave an empty hive, previously smeared on the interior with honey, in some convenient place, but not too near the old one.

When the swarm settles, the bees collect themselves in a heap round the queen, hanging to each other by means of their feet. When thus suspended from a tree, they may be secured by simply holding an empty hive under them, and tapping the branch from which they are suspended. They should, in this case, be sprinkled with honey and water, and confined for about twelve hours. When a swarm divides into two or more bands, and settle separately, it is probable that there are two queens. In this case you must secure one of them.

If through your inattention, a second swarm comes off, you should, as soon as you have hived it, secure its queen, and return the swarm to the hive ; indeed, when deprived of its queen, it will usually immediately return of its own accord. Swarming is a subject I have reason to believe is very generally misunderstood, most persons desiring to promote it, conceiving that the greater number of swarms, the richer will the hives be in August. The very reverse of this is the case ; for when a hive is weak in numbers, a sufficient number of bees cannot be spared to go forth for honey ; and, hence, they will be scarcely able to collect enough for their actual support, far less to collect any surplus for their master's benefit. Hear Mr. Briggs :—

“ The swarming of bees is a subject on which much misconception prevails. Most persons who keep their bees in the old straw-hive plan, and suffocating system, appear to anticipate their swarming with much anxiety, and to be of opinion that the greater number of swarms—firsts, seconds, thirds, &c.—that they obtain from their old hives during the summer, the more remunerative will they prove to the owner at the end of the season ; whereas the reverse of the above practice is much nearer of being the best system to follow, which I shall endeavor to eluci-

date. It has been proved from observation, that the average per centage of swarms have been—twenty-four in May, sixty in June, fourteen in July, and two in August ; from which it will appear that June is the principal month for swarming, in ordinary seasons ; and it is in June and July that the greatest quantities of honey are stored up by the bees, when managed in a judicious manner.

“ When the swarming is assisted and encouraged during June and July, the old stocks are considerably weakened, and the swarms are employed in building combs in their new hives, collecting pollen, and attending to the young brood, until the best part of the honey-storing season is over ; so that, at the honey harvest in autumn, it will frequently require the contents of five or six old stocks, or late swarms, to produce as much pure honey as might have been obtained from one colony on the system of management which is recommended.”

In collateral boxes, and in capped hives, swarming may be prevented by affording the bees additional accommodation, and reducing the temperature ; and for this end, it is recommended, by most apiarians, that the hive or box should be furnished with a thermometer as well as ventilator. I think, however, that even those who do not possess these accommodations may manage well enough by proper observation and attention to the symptoms I have detailed. When these appear in a collateral box-hive, open one of the partitions, and admit the bees into a new apartment ; if all be full, take off a box, empty and restore it. In the case of a capped hive, remove the bung, and admit the bees to the cap ; if full, remove, empty, and restore it. On this subject, Mr. Briggs says :—“ The most favorable degrees of heat for the prosperity of the brood are from 75° to 90° in the stock hive, and from 65° to 75° in the side boxes. The heat in a prosperous hive is sometimes upwards of 70° at Christmas, and will, in hot summer weather, sometimes rise to near 120° , at which time the combs are in great danger of being damaged, and of falling to the floor of the hive ; this may, however, be prevented, by giving extra room when required, and by shading the hives from extreme heat as previously directed. It should always be borne in mind that all operations with bees should be performed as carefully and as speedily as circumstances will permit.” The late Mr. T. Nutt remarked, in a conversation with him a few months previous to his decease, ‘ that in removing

'boxes, glasses, slides, &c., the apiarian should proceed in a manner so steady and cautious, that the bees should scarcely know that their habitation had been meddled with ;' in which remarks I fully concur."

After having a new swarm, you must also recollect, that if unfavorable weather follow their departure, you must feed them, otherwise they will be starved ; indeed it would be well if each new swarm were always fed for a few days, as this will assist them in gaining strength in numbers and in store, before the principal part of the honey season goes over. In conclusion I would merely say, that the weight of a good swarm should be from five to seven pounds, and that all under five pounds in weight should be united to others, as being too weak in numbers to support themselves.

You shall receive instructions for uniting swarms in the next chapter, as the process is the same as that adopted in depriving a hive of its honey. In hiving a swarm it is as well to be protected with a proper bee dress, as well as to use such precautions as you will find detailed in a subsequent chapter when treating of the honey harvest. *Prevention is better than cure*, and it is *better to be sure than sorry* ; yet bees are certainly less apt to sting at this time than any other.

Some persons are particularly unhappy in possessing those qualities which render them disagreeable to bees. The main objections are, excessive timidity, and likewise, with some an unpleasant odor, in some instances the result of personal negligence, but frequently of peculiarity of constitution. The remedies are, a *bee-dress* for the former, and the use of some strong perfume which the bees like, and which will effectually conceal whatever is offensive to them.

"I have gone among them," says Mr. Worlidge, in their greatest anger and madness, only with a handful of sweet herbs in my hand, fanning about my face, as it were to obscure and defend it. Also, if a bee do by accident buzz about you, being unprovided, thrust your face amongst a parcel of boughs or herbs, and he will desert you. But the most secure way of all, and beyond the completest harness yet published, is to have a net knit with so small meshes, that a bee cannot pass through, and of fine thread or silk, large enough to go over your hat, and to lie down to the collar of your dress, through which you may

perfectly see what you do, without danger, having also on a pair of gloves, whereof woollen are the best."

Some writers on bee management have suggested other modes to prevent objectionable swarming, besides the collateral boxes and the capped hive. Among these plans I may mention *storifying* or *piling*, and *eking*. The latter is speedily disposed of; it consists of adding *ekes*, or additional bands of straw to the bottom of the common hive, according as additional room was required. The objection is, that although it may thus answer your purpose during one season, the next finds you in as much perplexity as ever.

Storifying requires some notice, as it is a custom of very considerable antiquity, and also as it is a practice that has been approved by such eminent bee-masters as Warder, Thorley, and more recently by Dr. Bevan.

The principal objections to the storified hive are—

1st, Its occasioning the bees greater trouble and labor, and hence rendering their labor less productive.

2d, The absence of provision for dividing the ordinary cells from the more sacred and mysterious operations of the queen, and of course a consequent deterioration of the honey in respect of purity; besides much inconvenience and waste of time to the poor bees, which certainly should be taken into consideration. A laden bee cannot *mount up* from one box to another, and through a labyrinth of comb, with anything like comfort or ease.

3d, In taking a box of honey, the proprietor cannot be certain of not taking away a quantity of brood-comb, &c. This objection, however, may be classed with that which rests on the impurity of the honey, except with the additional one, that this also refers to loss of life, which the bees, both brood and adult, must thus sustain. And,

4th, In consequence of these objectionable circumstances, which are the inevitable consequences of the piling system, the profit accruing from such management will be far inferior to that obtainable by the system I have already recommended.

A very eminent writer on bee management says—"In piled boxes bees are subjected to unnecessary labor, which is so far a waste of time. From piled boxes not nearly the quantity of honey and wax is procured, that may be procured from collateral boxes; nor is that deficient quantity of a quality at all comparable with the other. In managing piled boxes many bees are

destroyed. These are my objections to that system of bee management ; and I put it to every person who has practised stonifying to say whether they are not well founded."

It sometimes, but very rarely, happens, that a swarm is almost wholly, if not altogether, composed of an entirely new generation of bees, but usually old and young go forth together. You may distinguish the young from the old by the intensity of their coloring, the latter being of a deeper red. The swarm is usually led forth by a *young* queen ; but at all events the bees never swarm unless led by a queen, and sometimes by *two* or even *three*. In this case the supernumerary sovereigns are put to death by the workers. Sometimes, indeed, instead of the supernumerary queens being destroyed, the swarm divides, and a portion follows each monarch, and sometimes the queens themselves do battle for the throne. The destruction of the supernumeraries by the workers is, however, the most common case.

Battles also will frequently occur in consequence of a swarm seizing upon a habitation already occupied by other bees, or two swarms simultaneously selecting a similar place of abode. The attack is said to be usually begun by the queens, with what truth, however, I am unprepared to say.

Having now suggested all that occurs to me interesting, or profitable for you to know, on the subject of swarming, we shall leave the bees at work, and in the next chapter presume matters ripe and ready for the "honey harvest."

CHAPTER IX.

THE HONEY HARVEST.

THOSE who possess collateral boxes may begin taking a box or a bell glass very early in the season, indeed even so early as May or June ; this must be, of course, dependent on the state of affairs, and on their own discretion. Those who keep their bees in the capped hive, may also get a cap full of honey in or about the middle of June—I do not call this the "honey harvest." I allude to the grand deprivation that should take place in the beginning or middle of August, ere commencing other operations still to be explained.

I may observe with reference to the collateral hives that no instructions of mine are necessary further than those already given when describing the mechanism of Mr. Nutt's boxes. You who possess these admirable contrivances will have little or no trouble —a child could manage them, and long ere this (August) you have already begun to gather your delicious harvest. You have, of course, had more than one bell-glass full, and possibly a box of pure honey removed in May. You have certainly obtained, at least, one box in June; but I should rather imagine that you have, during that month, obtained *both the side boxes* full of honey. You must now, however, act with caution, and recollect that wet, damp weather is unfavorable to the operations of the bees; they cannot go abroad to collect their treasure, and you must avoid trespassing too much upon their stores in such weather.

The old mode of obtaining the honey was, by the suffocation of the inmates of the hive. I fear I need scarcely tell the majority of my bee-keeping readers, but sincerely hope I am wrong, that this used to be effected by digging a hole in the ground, placing therein a bundle of matches, or scraps of tow dipped in sulphur, igniting these, and setting the hive, covered with a thick cloth over it, in the latter part of the evening. The fumes of the sulphur soon caused death, and the honey was removed afterwards at pleasure. Whatever others may think or write, I must assert as my own opinion that this is a most barbarous practice; and it is as silly as it is cruel. You, if you act thus, effectually prevent the fulfillment of what should be your chief object, viz., the increase of your stock, you also impregnate your honey with filthy vapors, and seriously injure its quality by the dead bodies, which you thus cause to be intermingled with the combs.

Mr. Huish recommended dried rags, or leaves, to be employed instead of sulphur, the smoke from these only producing partial stupefactions from which the bees subsequently recovered, when the surviving stock was *united* to some other *weak* hive in the apiary.

It is a long time indeed since Wildman, White, and others, showed that the honey could be taken, even from a common straw hive, without injury to the inmates. Without, however, wearying my readers with an investigation of the several approved methods of doing this, I shall briefly direct them as to

the manner in which I, myself, recommend this very simple process to be performed.

“Fumigation” is a word employed by bee-keepers to express the process in which, by the aid of certain intoxicating *smoke*, the insects become temporarily stupefied, in which state they are perfectly harmless, and may be deprived of their honey without any risk or trouble. They subsequently soon recover from their stupefaction, and are nothing the worse for it. Indeed, as Mr. Cotton quaintly observes, this intoxication proves, contrary to its effects in the case of man, rather salutary than otherwise. The dried *Fungus Pulvurulentus*, or fuzz ball; the *Bovista gigantea*, or frog-cheese, will be found best for that purpose: but, in their absence, rags steeped in a solution of saltpetre, or a few tobacco leaves, wrapped in brown paper, will do nearly as well. If tobacco be used, care is necessary, lest the fumigation be carried to too great an extent, so as to cause the death of some or all of your stock. Persons not accustomed to deal with bees, should wear an over-all of thin gauze over the head and breast, and gloves on their hands. With this, and a little bottle in their waistcoat-pocket, containing aqua ammoniæ, or aqua potassæ, to be used in case of accident, they need have no cause for trepidation, but can go to work with coolness and deliberation.

There should be provided, for the purpose of fumigation, a small tin box, with a tube extending from each of two opposite ends; one end of this tube being so fashioned that it can readily be inserted into the hive, and the other so formed, that it can readily be attached to the tube of an ordinary bellows. The box should be so formed that it can be opened at pleasure.

In this box the matter to be employed in fumigation is first placed, having, of course, been previously ignited, and the proper end of the tube having been inserted into the hive at the lower part, ply the bellows very gently. The bees begin at once to feel the effects of the smoke. At first, you will hear an unusual humming and commotion, but in less than ten minutes all will be still. The bees will fall upon the board under the hive, and lie quite still, as if dead. The hive may then be removed, and a fresh hive—the interior well smeared with honey—may be placed over them, or they may be united to another stock, which should also be previously fumigated, one queen being removed.

Some persons may conceive it to be a difficult matter to come at the queen. When fumigation is resorted to, she is, of course,

easily discovered ; but even when it is dispensed with, and the practice adopted which I have yet to describe, she is not so very difficult to come at ; for, on a hive being turned up and *tapped*, the queen is among the first, if not indeed the very first, who makes her appearance, as if to discover the occasion of the unwonted disturbance ; the *dusk* of an *autumnal evening* answers best for this purpose. The queen usually lodges near the crown of the hive, and is, when fumigation is resorted to, one of the last to fall ; she will, consequently, in this case, be found amongst the uppermost bees. In practising fumigation, two persons should act in concert, each taking a hive, and operating upon it, in order that both stocks should be simultaneously in a similar condition as to *intoxication*. I may add, that in fumigation, the hive must be well covered with a cloth, to prevent the escape of the smoke. When you have united the two stocks in the manner I have described, it is advisable to confine the insects to their hive for that night and the following day. Do not, however, wholly deprive them of air in doing so, or you may smother them. On the evening of the following day, about dusk, uncover the hive, and open the entrance. The bees will probably at first tumultuously issue forth, but finding the lateness of the hour, will as hastily return. Let me here forewarn my readers to be more cautious on this than perhaps any other occasion, as the bees will doubtless be very indignant at the manner in which they have been treated. They are naturally a very irritable insect, and if they find you near them and unprotected when they sally forth, they will be apt to attack you in a body. The sting of a bee is not only very painful, but even sometimes seriously dangerous.

The most suitable period of the year for uniting weak with strong stocks is from the middle of August to the latter part of September. This, however, is not a proper time to remove stocks from straw hives to boxes, for the season is too far advanced. When taken from their warm hive, and removed into a cold box, bees rarely recover from the effects of the fumigation sufficiently to resume business. May or June is the best time for this removal, or perhaps still earlier, say the beginning of April, before the eggs of the queen bee have attained the stage of larvæ. If the operation be performed in cold or even cool weather, it is recommended by Nutt to do so "in a room where the temperature is about 60 degrees." Twelve hours or thereabouts suffice for the

recovery of the bees, and they may then be removed with safety to their ordinary stand.

Various other precautions besides outer clothing are recommended by writers on bee management—such, for instance, as taking a short pipe in the mouth, and smoking during the operation: every one does not, however, smoke. Others recommend taking a drink of ale previous to commencing. Others again recommend rubbing the face and hands with ale or beer; for my own part, I do not see any absolute necessity for the adoption of any of these measures, if the protecting *overall* be used; but if I were to recommend any, it would be that spoken of by Mr. Briggs—viz., *water* to which a small quantity of *creosote* has been added. Mr. Briggs adds, “The juice of the *Black ocymum*, or Indian basil, is also strongly recommended for the same purpose; and it is said that the bees will not go near to a person whose skin has been recently rubbed with it. It is, I suppose, unnecessary to observe, that *aqua potassæ* will answer the same purpose, and fully as well. These remedies will likewise be found equally efficacious for the sting of that wolf of insects—the ferocious and formidable wasp. It may be as well that I wind up my observations on fumigation with a few directions for the preparation of the fuzz balls for that purpose.

Put the ball into a piece of stout paper, and compress it as tightly as you can; tie it closely up in this condition, and put it in a moderately cool oven, about as cool as that from which bread has just been withdrawn—let it remain there until it will serve as *tinder*. The quantity of the prepared fungus necessary for the fumigation of a hive is a piece of about the size of a hen’s egg—less *may*, in some instances, answer; but it is unquestionably better to have too much than too little. I should have observed, that, prior to union, even where fumigation has been employed, the sprinkling with liquid honey should not, on any account, be omitted.

The system which dispenses altogether with fumigation, called *tapping* or “Driving,” is spoken of favorably by many writers; it is as follows:—

When twilight appears, you will find the bees all quietly reposing in the hive; let whoever is in the habit of tending the bees be the agent in the process; no assistance is necessary; let him or her take an old chair from which the bottom has been either worn or cut away—but a worn one is best, as it best fits

the reversed hive ; turn up the *hive* on the chair, and place over it an empty one, which you have previously smeared interiorly with honey, or sugar dissolved in water ; wrap a cloth round the point of junction for the first few minutes, and, with a stick, tap the reversed hive round the sides, beginning near the bottom, and gradually ascending in your strokes towards the top ; let your strokes be not too rough, lest you loosen the combs ; still, however, these are far more firmly attached than non-practical writers are aware of.

Ere you have been long thus employed, you will hear a humming noise, and presently the disturbed bees, more than half asleep, will mount into the upper hive. If the ascent of the bees appear checked ere all have left the lower hive, remove the cloth, which, by the way, is, once the ascent has commenced, no longer necessary, and raise the upper hive an inch or so above the lower. This will be found to facilitate the emigration, and will be unattended with danger. The lower hive being fully deserted, place that containing the bees on the stand. Some like to close the aperture for a short time ; but I conceive such procedure to be useless, as, at that hour, the insects are too sleepy, too *stupid*, to have any desire to stir abroad ; and on the morrow will proceed to their ordinary avocations, as if nothing had occurred. This resumption, however, of the insects' ordinary avocations, will not take place unless the above operation be performed early in the season.

The most secure mode of procedure, and the most approved, is, to unite these exiled bees with those of another hive. You must always, be it remembered, leave your bees a sufficient store of honey as food. This is usually done by setting apart what is called a *stock-hive*—a hive well filled with honey, and capable of containing and supporting more bees. Turn up this stock-hive ; sprinkle its drowsy inmates, or rather *drench* them, with sugar or honey, dissolved in water. Do the same with your exiles ; and once again invert the abode of the latter over the mouth of your inverted *stock-hive*. Proceed in other respects as you did before ; and by *tapping* drive them down. The two families speedily recover from their surprise, and the agreeable employment afforded to all their individual members, of licking the results of your sprinkling from each other's bodies, will soon produce friendliness, meanwhile the odor of the liquid with which you have saturated them, will prevent their distinguishing

betwixt stranger and comrade. Of course you have previously taken the precaution of removing the *queen* of the swarm to be united to the stock hive. Some recommend permitting the rival queens to "fight it out." This is too apt to occasion a general affray, which can readily be avoided by the plan I mention. The whole procedure will not occupy above half an hour, if indeed so much. You need be under no apprehension of being stung. The bees are too sleepy, too lethargic, too much fatigued after their day's toil to care for you. In order to inspire you with confidence, let me call to your recollection the lethargic condition of common house-flies on a ceiling, in a summer or autumn evening. The bees are similarly disposed ; and unless you clumsily crush some of them in your hand, they will not *take the trouble* of hurting you. If you be so very clumsy as to do so, you have only yourself to blame.

This is your *first* harvest : you may, by adopting the following approved system of management, obtain even a second, ere placing your bees in their winter quarters. This latter operation is termed "shifting."

Many writers on bee management have been in favor of shifting the hives at certain periods of the year, in order to secure a succession of food, according as it fails in one place, or proves more abundant in another. One of the earliest advocates of this system was Columella. He founds his advice on the observation that scarcely any one district can afford an equally adequate supply of pasture both in spring and autumn. Celsus and Pliny hold the same opinion. Later writers have also recommended this removal, as A. de Montfort, Maillet, in which they are followed by Wildman and others. This practice is still extensively followed, and there is still living on the Pentland hills near Edinburgh, a shepherd, who takes charge of upwards of a hundred hives annually for bee-keepers living at a distance.

From the middle of August to the end of September is the usual time when we perceive the food of bees beginning to fail them. This is the period for removing them to new pasture, which is then in bloom. Before moving, ascertain the condition of your hives ; for these which are well stocked with honey should be *deprived* by the process already detailed ; and this should be done some days prior to removal, for the combs containing the young may have been loosened in the operation, and

the bees should be allowed time to fasten them once again securely in their places.

“ Water carriage, when procurable, is the best, as it shakes the hives least ; but when land carriage must be resorted to, the hives should be carried on poles, slung on men’s shoulders. The journey should be pursued at night only, and the bees suffered to go forth and feed during the day. Such is their instinct, that they will readily find their way back ; but they should not be suffered to go forth until at the distance of upwards of ten or eleven miles from their original home, otherwise they will be lost in endeavoring to regain it—a moderate distance induces them to abandon the idea, and to become reconciled to their new quarters. If traveling by canal, the hives should be removed from the boat, and placed on stands, at some distance from the bank ere the insects are let out, otherwise they will be lost in thousands by falling into the water on their return. If your weak stocks happen to be placed near the strong ones of some one else, you will stand a fair chance of having them all killed in encounters with their more powerful neighbors. It would be well also to see that your hives are placed in a situation where they will be safe from the attacks of cattle or other foes. Before fetching the hives home again, it will not be amiss to ascertain their condition and weight, and to take from them what honey they can spare.

I must here inform you how to ascertain the state or wealth of a hive. About the middle of September examine your hives ; at all events do not, whatever be the aspect of the season, neglect this necessary operation until October ; but if the season appear likely to turn out to be a severe one, set about it even earlier than I have indicated. But do not mistake me—I do not mean that you can *deprive* your bees of any honey so late as this ; if I said so, I should be only instructing you in the best and most expeditious method of destroying your stocks. I only mean, that under certain circumstances, and in peculiarly favorable weather, you may postpone until the periods I have named, your *final* examination of your stocks, in order to ascertain which *can*, and which *cannot*, support itself, unaided by you, during the winter months.

In *observatory* hives, and such as are formed on the collateral box, or *piled* box principle, there are usually such contrivances as will admit of inspection of the hive and its contents without the

necessity of handling it. In the ordinary hive, however, we cannot avoid *manually* ascertaining the weight and condition of our stock. In order to do so, you must previously have been acquainted with the weight of your *hive*, and of the probable number of bees which it contains; and I may also add, that it would be as well if you had your stands so contrived as to admit of their being raised with the hive for the purpose of weighing, as, if you forcibly separate the latter from the former, you break the cement of *propolis*—a substance I have yet to describe, which unites the hive to its position on the stand, and puts the bees to much unnecessary trouble and annoyance.

A hive should contain *twenty pounds* of honey for its support during winter; an *increase of number* in the hive, produced by *union*, will not require an increase of food. Precisely the contrary is the case; and the more abundant the stock of the bees in autumn, the richer and the better able to work will they be in spring—the more forward, therefore, will they be in summer, and the greater will be your profit.

There should be twenty pounds of honey left in a hive for winter consumption, exclusive of the weight of both hive and bees. Of course I cannot give you any assistance in ascertaining the weight of the former, as that feature must depend upon its structure, &c., and the materials of which it is composed. But the weight of the bees themselves is quite a different matter. In 1lb. *avoirdupois*, or 16 oz., there are about five thousand bees—from fifteen to twenty thousand bees constitute a strong hive, that is, from *four to five pounds* in weight.

If you find, after making these calculations and deductions, that your stocks are under weight, you may either supply them with food or unite two or more together. I am in favor of union; I now only speak with reference to such persons as have reaped a second, or perhaps a *third harvest* from their bees. Had they omitted the last, no such care would have been called for.

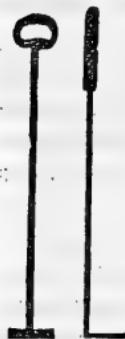
Mr. Briggs, in a few words as to autumnal *feeding*, says, The hives should be weighed. *Age* will cause hives to weigh heavier than their *legitimate* contents would call for; this is occasioned by an accumulation of *bee-bread* and the cast sloughs which had formerly served as envelopes to the young. In the case of old hives, you must, therefore, allow from two to five pounds, according to age, for these matters. These substances require to be occasionally removed from the hive, as otherwise they will accumu-

late to such an extent as to render the hive too small for breeding, and your stock will thus soon become extinct. Spring is the proper season for removing these substances ; the process is very simple, consisting merely in fumigating the hives, and thus rendering the bees for the time insensible, then, while they are in this state, turning up the hive and cutting out a portion of the old comb ; you should only cut away half at a time. The following spring, perform the same process ; you will find the gap your knife had made the previous year completely restored, and you may now remove the remaining portion of old comb. By this system of constantly inducing a renovation of the combs, you will preserve your stock in a state of perpetual youth. Your hive, even if made of straw, will last for an indefinite length of time if protected externally by a thick coat of whitewash, or, which is better, Roman cement ; do not let any one persuade you to employ paint for this purpose ; if you do, you will lose your bees. This cutting away of the combs may also be resorted to in cases where your hives are infested with moths ; under such circumstances you may cut away *all* the combs that contain the larvæ of those insects.

EVERY bee-keeper should have an ordinary spatula, and a set of bee knives. These should be in the forms of the cut. They should be a foot long, beside the handle, of metal ; and the blades should be so sharp as to *cut* the combs and not *bruise* or *break* them.

All hives under the clear nett weight (bees and honey, the hive and stand properly deducted) of 20 lbs. *avoirdupois*, must receive an allowance of food ; the examination to take place at the close of September. *Honey*, when you have it and can spare it, is, of course, the best food you can give your bees, and will not, as Mr. Huish has asserted, give bees the dysentery ; but if you cannot give honey, you may form an excellent substitute by boiling ale and sugar together gently in a clean and well-tinned vessel, over a clear fire, for about five minutes. One pound and a-half of sugar may be added to each quart of ale, and the mixture is to be skimmed, according as the scum rises to the surface during boiling ; when the syrup is taken from the fire, add to it about a teaspoonful of common table-salt for each quart of syrup.

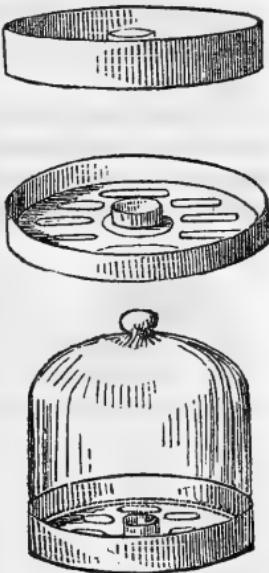
The cuts show a bee feeder. There is a hole in the centre and tube in it. The lower cut shows the feeder with a glass bell



over it. It may either be placed near, or on top of the hive with the tube going into a hole in the top of the hive.

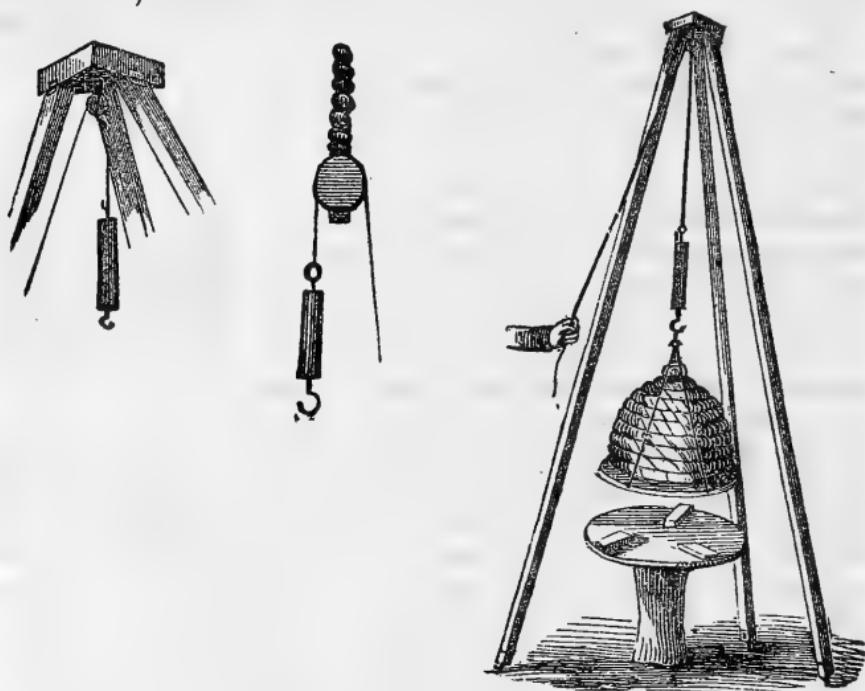
It is bad to be compelled to feed bees in the winter, as, by descending to the bottom of the hive in order to get at the food, they expose themselves to cold, and many perish; by early examination in autumn, and uniting weak hives, together with judicious feeding *at that season*, if necessary, the winter management will be simplified.

Bees kept in boxes are as liable as any others to the attacks of insects, mice, weasels, and other foes. In such case the stand should have been removed, and traps or poison used to banish the vermin. You will sometimes find the bees strong in numbers, yet poor in stores. This may also be a result of the presence of moths, &c., in the hive; that should, therefore, be examined, and the intruders removed. Do not, on any account, fumigate a hive with tobacco or sulphur for the purpose of expelling or destroying moths; for, if you fail of destroying your bees along with them, you may safely calculate on, at all events, rendering the *honey injurious* to them; and, in some cases, especially when tobacco has been used, absolutely poisonous. Doubtless, it was honey, impregnated with these deleterious fumes, that Mr. Huish found to give his bees the dysentery. When bees are found to be thus rich in numbers and poor in store, it frequently happens that the cause is the loss of the queen; for if anything happen to the sovereign, the community speedily decay away. The remedy in this instance is, of course, union to another stock. If this occur in winter, I should recommend you to unite, and feed abundantly. Mr. Nutt, however, says, that when this occurs in winter, all your feeding will be thrown away, and your bees perish, despite your care. Some people also defer feeding until the bees are absolutely in want. This is very wrong; the assistance should be rendered several weeks before the hive is in a state of positive destitution, otherwise, when you *do* feed, the bees will be too weak to avail themselves of your bounty. The good mode of feeding is, to put the honey, or syrup, as the case may be, in a shallow box; lay over the sweet liquid



a sheet of strong paper, perforated with holes, through which the bees can suck the syrup without falling into the mess, or becoming clogged by it; attach the box to the mouth of the hive, the bees will soon make it out, enter, and remove the store to their cells.

It is bad to *lift up* the hive for the purpose of feeding, as, by so doing, you lower the temperature of the interior, and often destroy your stock. When the feeder is attached to the entrance of the hive, all this is obviated.



It is quite important to the bee-keeper to have a *weighing machine*. This may consist of three poles of wood, seven feet long, fastened by hinges to a triangular block of wood, six inches on each side. The poles must have spikes at the lower end, to stand firmly on the ground. To the underside of the block is fastened a pulley wheel. Over this a cord passes, one end of which is held by the hand, while to the other is attached a spring balance, with a hook at its end. The cut will show the method of using.

CHAPTER X.

MANAGEMENT DURING WINTER AND EARLY SPRING.

ONE of the most important particulars connected with bee management, is taking care that they are abundantly supplied with food in autumn, and also taking care at that season to ascertain whether or not they are sufficiently strong in *numbers*, and if not, *to unite your weak stocks*, so as to form *strong ones*. It is by such treatment as this that you may expect to preserve your bees in health and strength through the winter, and *to* have them in a condition to attend properly to their brood in the early spring.

In a large straw hive, there should be left, at your autumnal honey harvest, from twenty to twenty-five, or even, according to the size of the hive, thirty pounds weight of honey, exclusive, be it remembered, of the weight of hive, stand, and bees. If you should, from any accident, find your hive deficient in weight, you must make up the deficiency by artificial feeding, either with honey or with the mixture of ale and sugar.

Having ascertained that you have supplied your stocks with a sufficiently ample quantity of food for their support during winter, or that they already possess enough, you should next *narrow* the entrance of the hive so that it will scarcely admit of the passage of more than a single bee at a time ; and towards the middle of November the entrance should be closed nearly altogether. The hives should be covered up with matting, fern, or other similar substance, in order to preserve them from rain, frost, or, the most dangerous of all, the sun's rays of a fine winter's day. These deceptive rays would afford a temptation to the bees to sally forth, and the result would be, that they would become chilled by the cold. Few would survive the flight so as to return to the hive : its temperature would fall, and you would lose your stock. Your hives should remain thus carefully covered and closed until the beginning of March.

I must here mention a mode of protecting your hives, and rendering them in point of warmth in winter, coolness in summer, imperviousness to wet, inaccessibility to moths, and other foes at least, unless through the entrance, and also in durability, equal to wooden boxes, viz., a coating of Roman cement on the exterior.

When there is snow upon the ground, the entrances of your hives should be entirely closed, and a screen or shade should be placed before the hive, in case of an accidental sunny day occurring, in order to prevent the bees from encountering even a single deceptive ray.

Another danger from which you are imperatively called upon to protect your bees during winter is *dampness*. It is to this cause that the loss of many a stock is to be attributed—an *internal dampness*, generated within the hive itself. This is best remedied by careful ventilation, placing a bell-glass, well covered with flannel, over the aperture on the top of your hive or box, removing it from time to time, and carefully wiping away from its interior the damp formed by condensed vapor; this remedy is at once simple and efficacious.

It will, perhaps, appear to some of my readers a singular experiment, resorted to by some bee-keepers, viz., *burying the hives*. When this is to be attempted, the hive should be buried in a cool, dry, shady place, among leaves, about a foot deep, and the interment should be performed during the first or second week of November.

A friend buried a hive of bees, in the first week of November, about a foot deep, amongst dry leaves, &c., and disinterred it in the last week of February, when it was just 2 lbs. lighter than it was in November, and the bees in a lively and healthy state. Another person immured a hive of bees in the earth, four feet deep, in the second week of November, and at the end of January it was removed, and weighed only 3 oz. less than it did before it was buried.

The above experiments are worthy of attention; a shed, having a northern aspect, and which is as dry as possible, would be a suitable place for further trials. The principal points by which there might be cause for fear of failure, would, as in other cases, be from dampness, disease for want of fresh air, and attacks from vermin, &c. To prevent the former I would recommend that the hives be placed on a long frame of wood, covered by a web of closely-worked wire, and raised a few inches from the ground, the ends of which should communicate with, and be occasionally opened to, the fresh air. A long tube should also be placed from the hole at the top of each hive to the open air of the shed, from the upper end of which any dampness might be condensed by bell-glasses, and conveyed away as already directed.

The materials with which the hives are covered and surrounded, should consist of dry leaves pressed closely together, or dry and powdered charcoal or cinders, and may be several feet in thickness, to preserve the bees in a cool and torpid state, and at a regular temperature, in which state they should be kept as *dry, dark and quiet* as circumstances will permit.

It is the opinion of many experienced apiarians, that a cold winter is not injurious to bees, provided they are sufficiently prepared for withstanding it, in the manner above detailed; and which, I trust, comprises several facts, hints, and suggestions, which are not generally known, and may be of service to bee-keepers of the present day.

It is considered that those localities which are suited to the cultivation of good barley and Dutch clover, are also suited to the production of honey, and that where a rose will prosper, a bee will prosper also; consequently there are but few situations in which the keeping of bees might not be profitably extended.

In all plans and operations with bees, the laws of nature should be attentively observed and assisted, by which much may be experienced and acquired from attention and perseverance, and the results aimed at obtained at less trouble and expense than if an opposite course were pursued.

As the spring approaches, the winter coverings should be gradually removed, and those hives which have been buried placed in their summer situations. Small quantities of food should then be supplied as occasion requires, until winter is past.

It must always be borne in mind that seasons, situations, and the laws of nature, present influences which may be guarded against, or assisted, but cannot be completely controlled. Thus, the aspect for the entrances of the hives may require to be varied a few points between the eastern and western sides of the kingdom; and there may also require to be, on some occasions, an advance or delay of a few weeks in some operations with bees between the northern and the southern parts of any country of some considerable extent.

Among other obvious mistakes, I may mention the recommendation to give the bees an opportunity of leaving the hive, and going abroad every fine day, already detailed. What advantage is expected to be derived from thus permitting the insects to go forth? They may be supposed to want exercise. This is a mistake; for the bees naturally crowd together, and remain in a

sort of torpor during winter, and every thing that could tend to interfere with, or arouse them from it, must, of course, prove contrary to their natural instincts, and consequently, prejudicial. During winter the bees are inactive.

It seems generally recommended that the hives should be removed to a northern aspect during winter. If the bees are to be set at liberty, this very removal, otherwise so necessary, will cause their destruction ; for they will, on being permitted to issue from the hive, of a certainty fly back to their old quarters, where they will remain until benumbed by the cold that, despite a few gleams of treacherous sunshine, pervades the air, and will, of course, soon fall to the ground, and miserably perish—all owing to your bad management.

Independent of these considerations, I may also, and I think most reasonably, adduce the very considerable, and at the same time, most unnecessary *waste of food* consequent on the adoption of the liberty system.

Bees can endure the extreme cold of a Russian winter with impunity, while a far inferior degree of cold often proves fatal ; the true cause of the phenomenon is the *greater dryness* of the Russian climate, and that to *dampness* it is that we are to ascribe failure.

An old French work suggests a mode of preserving bees by *interment* during winter. It consists of laying some very dry, powdered earth upon the bottom of an old cask, to the depth of about half a foot, pressed down very hard, and setting on this the stool with the hive ; then preserving a communication with the air, by cutting a hole in the cask, opposite to the mouth of the hive, and placing a piece of reed from the mouth of the hive to the hole in the cask ; then covering the hive up with a quantity of dry earth similar to that on which it stands. In spring it is only necessary to remove the winter coverings gradually and with caution ; to examine also the state of the bees' provisions, and, if necessary, feed them. Be cautious in at once giving them liberty, or in doing so too early, or in unsettled weather. The mouth of the hive should be kept facing *due west*, until all these dangers have passed away : when the working season arrives, the aspect of the hive must be moved southward, and the insects left entirely to themselves. When spring-feeding is necessary, it is usually in April, for then the demands of the young brood call for a greater consumption of honey than ordinary, and from

want of attending to this circumstance, hives have been lost even so late in the season as the month of May.

About the beginning of the month of March, is the proper time for transferring stocks from hives to boxes; the latter should be previously well cleaned out, their interior smeared, and supplied with a portion of honey, in a proper feeder.

As the warm weather approaches, shade your hives from the sun. If the bees be induced by the heat to attempt injudicious or ill-timed swarming, and hang in clusters about the entrance of the hive, you can check it by sprinkling them with some water from the nose of a watering pot or syringe; they will mistake this for rain, and retire within the hive to resume their work.

CHAPTER XI.

THE DISEASES AND ENEMIES OF BEES.

BEES, when properly attended to, and managed on the improved modern system, are neither very subject to disease, nor very liable to suffer from the attacks of enemies; still, however, accidents of these kinds will occur, once in a while, despite of our most anxious care.

The diseases of bees are not numerous, so that a lengthened detail will be unnecessary.

DISEASES OF BEES.

These are Diarrhoea and Dysentery. The latter is probably only produced by neglect of the former: at all events, we may regard these two affections as springing from the one cause, and certainly they can only be combated by the same remedies.

COLUMELLA speaks of diarrhoea as a purging which seizes bees annually, in the spring; and conceives it to be occasioned by the bees surfeiting themselves on the young flowers in their first repast. He recommends a remedy, still earlier proposed by Hyginus, viz., covering the bees with the warm ashes of the fig-tree. On his own part, Columella recommends giving them rosemary and honey diluted with water.

In my opinion this looseness is occasioned by the bees feeding on what is called "candied honey"—a substance, the deleterious effects of which were well known to Aristotle, and subsequently

to Virgil, who gives, in his account of bees, express directions for preventing honey from candying. He regarded the cause of its doing so to be cold.

I cannot very positively account for the formation of candied honey, unless, as is very probable, Wildman's opinion be correct, viz., that it becomes so by being *too long* in the hive, too *stale*, and hence unfit for use. The mode of prevention is obvious:—A periodical examination of the hives or boxes, and a removal of a portion on each occasion of the old or mouldy combs. The presence of candied honey in a hive is so obnoxious to bees, that it frequently induces them to desert it.

The candied honey proves fatal to bees in another way beside their being poisoned by it. When the bees find candied honey in the combs, they, knowing its prejudicial qualities, if they have other and wholesome store, throw it out of the combs, and it of course falls on the bottom board of the hive. In doing this the bees prepare their own graves. They can neither enter nor leave the hive without bedaubing themselves, and their endeavors to free themselves and their companions from the incumbrance only make matters worse. When bees are found in this state, it is difficult to relieve them; but if anything will do so, it is immersion in *tepid water*; for this purpose you can sweep them into a tub with the wing of a fowl, leave them in the water until insensible, and *unite them*, when they revive a little, to the bees of another hive, taking care to serve these latter similarly. Though I recommend this treatment, I can by no means pronounce it infallible; but I have known it to succeed in more than one instance.

In an old French treatise we find purging and dysentery attributed to the bees feeding on *too pure honey*, which is there said not to be sufficiently substantial for them by itself. The cure recommended is to give them from another hive combs well supplied with bee-bread or crude wax.

ENEMIES OF BEES.

These are far more numerous than their diseases, and are as follows:—

Poultry, Mice, Toads, Frogs, Snails, Slugs, Caterpillars, Moths, Millipedes, Woodlice, Ants, Lice, Spiders, Wasps, Hornets.

Fowls should not be permitted in any apiary. They will kill and eat the bees, and such as they do not destroy they will annoy and disturb—besides, your bees will probably occupy a

stand in your *garden*, a quarter whence other reasons should necessarily exclude poultry.

MICE.—While the bees are vigorous, the field-mouse does not dare attack the hive; but as the cold approaches, and the bees become less active, he enters, and commencing with the lower comb, ascends by degrees as the bees become torpid, until he either clears all away, or by the smell of the honey he has wasted on the board, induces other bees to come and plunder. As soon as the warm weather returns, the surviving bees will leave the hive in disgust. The remedy is easy. By having your straw hives, if you use such, coated on the exterior with Roman cement, you will prevent mice from nestling in the straw, whence otherwise they would speedily eat their way into the interior, and by *narrowing* the entrance of the hive in the manner already described, you will effectually keep out these little intruders. If your stands be placed on a single foot, or if the feet are so placed under the foot board as to leave a wide, projecting *ledge*, no mice can arrive at the hive.

TOADS will kill bees occasionally, but not in sufficient numbers to excite our alarm; but is rather to be regarded as a friend to the bees, one of their enemies, the *spider*, being his favorite food.

FROGS may be classed with **TOADS**.

SNAILS and SLUGS.—These creatures are not absolutely *enemies* of bees, as they have no design upon them or their honey in entering the hive, but merely do so from accident. The mischief done by them consists in the alarm and confusion they occasion. The bees first attack the unfortunate intruder and kill him with their stings, after which they carefully encase him in propolis, effectually preventing putrefaction or the production of maggots.

CATERPILLARS.—The most dreaded is the caterpillar of the *Wax-moth*, so called from the ravages it makes amongst the combs as soon as it obtains entrance. By having the legs of the stand placed as I have already described, no caterpillar can climb up to the hive; but this will not prevent the *MOTH* herself from entering and depositing eggs in the hive; and so prolific are these moths, that a single brood would suffice to destroy a whole stock. Periodical fumigation, and cutting away such combs as contain the grubs, is the remedy to be adopted. Moths are only *nocturnal* enemies. During the day you have nothing to fear from their attacks. Let the entrance to the hive, there-

fore, be *nearly closed* in the evening, and you will protect your bees from their ravages. Columella recommends, as a trap for moths, a bottle, or other vessel, with a long and narrow neck increasing gradually to a wide mouth, and having a *light* in the neck, to be placed under the hive in the evening. I can vouch for the efficacy of this trap—it will destroy numbers. Another particular to be attended to is to have your stocks sufficiently strong; and for this purpose, if the hive attacked be weak, unite it to the bees of another hive, in the manner already described. The bees are themselves, if sufficiently strong in numbers, both willing and able to destroy the intruders. If weak, they will necessarily fall victims.

MILLIPEDES, or **WOODLICE**, are often produced by the *stand* being made of decayed wood, or the hive being placed too near an old hedge. Let the stand be of new wood, and strew *soot* on the ground under and about the hive. This will also serve in part as a protection against the attacks of

ANTS.—You should always destroy such ants' nests as you find in the neighborhood of a hive. In the West Indies *glass feet* are used to prevent these insects from getting into furniture, &c. Might not such be used with advantage for bee-hives?

LICE.—These are small parasitical insects of a red color, which adhere to the body of the bee, and derive their nourishment from her juices. They are about the size of a grain of mustard seed, or rather smaller.

Reaumur and others tried many remedies for these troublesome insects, but in vain, till at length Madame Vicat discovered that *Morocco tobacco* will kill the lice without injuring the bees.

SPIDERS.—Brush away their webs wherever you meet with them near your stand.

WASPS and **HORNETS**.—These insects are most noxious to bees. Dig up and destroy their nests wherever you meet with them; but you will most effectually get rid of them by offering a reward for every queen wasp brought to you in spring. The destruction of each queen is tantamount to that of an entire nest; and if this plan were generally adopted, wasps would eventually be extirpated.

BIRDS.—Among those which are the greatest enemies to bees, I may mention *sparrows* and *swallows*. Set traps near the hives, baited with dead bees; shoot the birds; and hang up a few of

such birds as you kill, on trees near the stands. Perseverance for a time in this will rid you of the annoyance.

BEES.—Bees are amongst the most dangerous foes of their own kind, being bold and resolute plunderers. It is only weak stocks, however, that suffer, so that *union* is the obvious cure. Avoid also placing your hives too close together; and also avoid at any time placing a weak stock near a strong one.

I have now enumerated the principal foes you have to apprehend, and you will find if you follow my directions, they will not prove so very formidable, but be much more easily got rid of, or guarded against, than you imagined. On the other hand, if you neglect proper precautions, and suffer the enemy to remain unmolested, you will be equally astonished at the incredible amount of mischief they will do, and the rapidity with which they will do it.

CHAPTER XII.

HOW TO TREAT THE PRODUCE OF YOUR HONEY HARVEST.

In the first place, you must remove your store to some room without a fire-place, for the bees have been known to make use of even that mode of access in order to come at the honey, which they are able to scent from a considerable distance. Close all the doors and windows. You should previously have in the room whatever implements you want—viz., some large glazed earthen vessels, clean, new, horse-hair sieves, a *strainer*, some clean linen cloths, and abundance of water to wash your hands. Wildman recommends burning cowdung, or rotten hay, at the doors and windows of the room in which you are at work, in order to keep away the bees, and experience has shown that this recommendation should be attended to.

Your first care should be to examine the combs, and free them from all dirt, grubs, young bees, or other foreign matters—remembering, of course, to have previously well and thoroughly washed your hands. You then cut the combs horizontally into pieces of an inch wide, and lay them on the sieve over the glazed earthen vessels; when they have dropped all the honey that they will yield without squeezing, put them in the cloth already mentioned, and *wring it* over another crock; this will furnish the

second class honey—that *spontaneously* yielded is called *virgin* honey, and is equal in purity to that obtained from the bell glass.

Some have recommended heating the combs in order to procure an inferior, a *third*, description of honey; but this is bad. When you have obtained all that you can *squeeze* through the cloth or bag, carefully cover up the two sorts, put the combs, also well covered, into a vessel by themselves, and remove all the other cloths, vessels, and other utensils, to the *apiary*, that the bees may *lick them clean*.

Your next object is to obtain the *wax*; for this purpose, put the combs into a clean vessel, and add as much *soft* water as they will float in—*distilled* water would be best—but *rain* will answer nearly as well. Place the vessel on a clear and not too hot fire, and watch it, stirring occasionally until the combs be completely liquefied. You then strain this through a fine canvas bag, into a tub of cold water. The water first flows through, and then the bag requires *pressure* to make it yield the wax. The simplest *press* is that recommended in Mr. Nutt's book:—“Have ready then a piece of smooth board of such a length that, when one end of it is placed in the tub of cold water, the other end may be conveniently rested against, and securely stayed, by your breast. Upon this inclined plane lay your dripping, reeking strainer, and keep it from slipping into the cold water by bringing its upper part over the top of the board, so as to be held firmly between it and your breast. If the strainer be made with a broad hem round its top, a piece of strong tape or cord passed through such hem will draw it close, and should be long enough to form a stirrup for the foot, by which an additional power will be gained of keeping the scalding hot strainer in its proper place on the board; then, by compressing the bag, or rather its contents, with any convenient roller, the wax will ooze through and run down the board into the cold water, on the surface of which it will set in thin flakes. When this part of the operation is finished, collect the wax, put it into a clean saucepan, in which is a little water, to keep the wax from being burned to the bottom; melt it *carefully*, for should it be neglected, and suffered to boil over, serious mischief might ensue, liquid wax being of a very inflammable nature; therefore, melt it *carefully* over a *slow fire*, and skim off the dross as it rises to the top; then pour it into such moulds or shapes as your fancy may direct, having first well rinsed them, in order that you may be able to get the

wax, when cold and solid, out of them, without breaking either the moulds or the wax ; place them, covered over with cloths or with pieces of board, where the wax will cool slowly ; because the more *slowly it cools, the more solid will it be*, and free from flaws and cracks."

You may *bleach* your wax by re-melting it, and running it several times into very thin cakes, suffered to cool, and exposed to the influence of the air and sun. This will render the wax perfectly white.

You will find the separation of the honey from the wax, and the sale of these substances separately, much more profitable than the sale of the honey in the comb. The larger the cakes of wax are, and the better, the higher price it brings. The same may be said as to the *purity* of the honey. Honey may be *clarified* by placing the vessel containing it in hot water, and continuing to skim as long as any scum arises. In order to *preserve* honey, it should be stored in jars, well *bladdered*, and otherwise secured. It should also be kept in a dry place.

MEAD.—Some persons may feel desirous of making for themselves this once famous drink, and I shall accordingly furnish them with simple directions for so doing. Common mead is formed by mixing two parts of water with one of honey, boiling them together, and taking off the scum.

Fermented mead is formed of *three* parts of water to one of honey, boiled as before, skimmed, and casked. The cask is to be left unbunged and exposed to the sun, or in a warm room, until it ceases to *work*. It is then bunged, and in about three months is fit for use. The addition of a *ferment* is of course necessary, taking care that it be *sound, sweet, and good*.

Hops are an improvement to mead, taking from its extreme sweetness ; and so is the addition of chopped raisins boiled with it, at the rate of six pounds of honey to each half pound of raisins ; also some lemon peel ; a few glasses of brandy, &c.

METHEGLIN is only another name for mead, altered by the addition of various ingredients, according to the taste of its preparers. These liquors may be *racked, fined, &c.*, like other wines, and will, if properly managed, keep for years.

It now only remains for me to conclude my account of the hive and the honey-bee with a few parting directions, forming a sort of summary of the instructions I have already endeavored to convey :—

I.—Never suffocate your bees.

II.—Do not take too much honey from them at the honey harvest.

III.—Keep them in such receptacles as will admit of extending their accommodation when desirable, and thus preventing the necessity of unwished-for swarming.

IV.—Unite weak hives in autumn, and leave the bees a sufficiency of food for the winter, so shall they be strong in store and in numbers in the spring.

V.—During winter keep them *confined, cool, dry, and quiet*; and in spring again examine and feed *liberally* such stocks as require it; and

VI.—If you, by attending to the advice I have endeavored, through the medium of this little volume, to convey to you, succeed in the culture, and discover how profitable as well as how interesting a pursuit it is, when judiciously conducted, communicate your experience to your neighbors. Abjure selfishness, and so may you prosper; and in after years you will, perhaps, congratulate yourself on having bestowed your attention on the

HIVE AND THE HONEY-BEE.

THE END.

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